

# Domestic and International Trends

— Japan’s cooperation with the efforts of other countries and key points of the Radio Policy 2020 Study Group Final Report —

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## 1. Introduction

Nowadays, the use of radio waves is expanding into a wide variety of fields that are essential for our daily lives, including not only communication networks such as mobile phones and wireless LANs, but also robotics, medicine and the environment. It is also expected that the Internet of Things (IoT), where everything is connected to a network, will soon be in full swing.

On the other hand, there are demands for the provision of new mobile services that can handle the increased traffic levels resulting from the evolution of mobile broadband networks. In response to this situation, the Ministry of Internal Affairs and Communications has been promoting efforts aimed at delivering fifth generation mobile communication systems (5G) in time for the Tokyo 2020 Olympic and Paralympic Games. These include joint R&D projects between industry, academia and government institutions with the aim of delivering enhanced Mobile Broadband (eMBB) while supporting massive Machine Type Communications (mMTC), international cooperation involving

stronger ties with governments and 5G promotion organizations worldwide, comprehensive trials that are scheduled to begin in 2017, and discussions of frequency allocations for 5G networks.

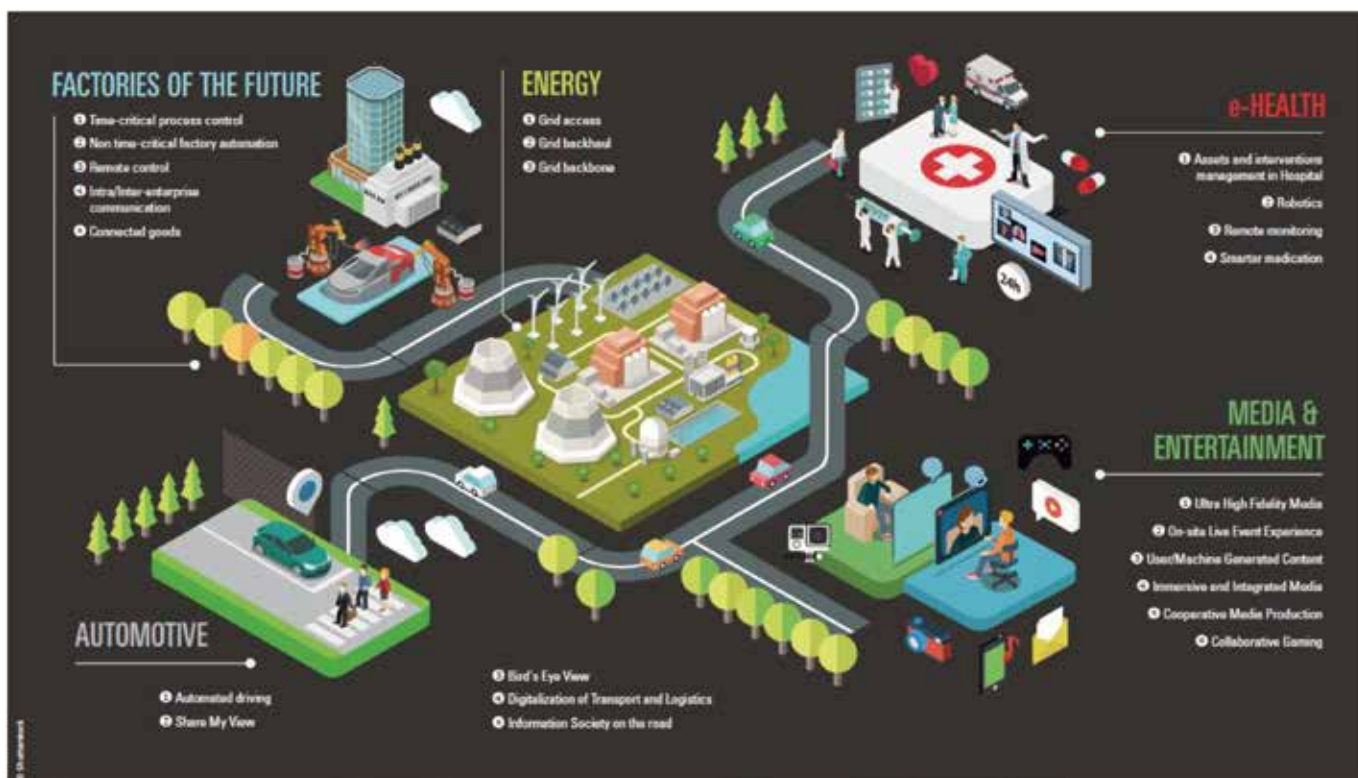
This article introduces the efforts being made to realize 5G, particularly regarding Japan’s cooperation with the efforts of other countries, and the Radio Policy 2020 Study Group that was opened by the Senior Vice-Minister for Internal Affairs and Communications between January and July 2016.

## 2. Foreign initiatives

### 2.1 Europe

Through the Horizon2020 framework for the promotion of research and innovation throughout the EU, the European Commission plans to invest €700 million over the 7-year period from 2014 through 2020, with an additional €3 billion or more to be invested by the private sector. Since 2015, further R&D projects such as METIS II have been set up to make use of this program under the 5GPPP R&D project.

Figure 1: Fields of 5G utilization in Europe



Source: 5GPPP, 5G empowering vertical industries(Feb 2016)

In September 2016, a 5G action plan was published to summarize the details of demonstration experiments and standardization policies in preparation for the launch of commercial 5G services by 2020. Candidate frequency bands for 5G were announced in November 2016. These include the 3.4–3.8 GHz, 24.5–27.5 GHz and 700 MHz bands.

Regarding the use of 5G, the 5GPPP has identified five key fields with “Vertical” connections (automobiles, factories/manufacturing, energy, health/medicine, and media), and is holding specialized workshops and other events to develop stronger ties with the fields where 5G will be used.

In the UK, a 5G Innovation Centre (5GIC) has been set up at Surrey University with the cooperation of the industrial sector, and trials using a 5G radio technology testbed were started in 2015.

Communication equipment vendors including Ericsson and Nokia have also been cooperating with communication providers in various countries, and are leading the way in 5G joint R&D initiatives and standardization efforts including the 3GPP.

## 2.2 United States

On 14th July 2016, the FCC (Federal Communications Commission) announced that it would reserve frequencies for 5G services. In particular, it was made clear that the 27.5–28.35 GHz and 37–40 GHz bands would be licensed, while the 64–71 GHz band would be made available for unlicensed use. The unlicensed 64–71 GHz band is to be combined with the 57–64 GHz band, which is already unlicensed, resulting in the availability of a continuous unlicensed band of 14 GHz. There are also plans to introduce a mechanism for dynamically sharing bandwidth between commercial applications and other commercial or public applications in the 37–37.6 GHz band.

In the private sector, the Verizon 5G Technology Forum was established in September 2015 by Verizon together with other participants including Alcatel-Lucent, Ericsson, Nokia, Qualcomm and Samsung, and since 2016 it has been actively involved in carrying out field tests. Verizon has announced that it will begin 5G commercial services using the 28 GHz band from 2017. AT&T is also planning to introduce 5G at an early stage, and is engaged in verification trials with Ericsson and Intel, among others.

## 2.3 South Korea

South Korea is currently gearing up to host the 2018 Winter Olympics in Pyeongchang, and Samsung is working towards holding trials in partnership with other companies including KT and SK Telecom. They aim to implement 20 Gbps high-speed communication using the 28 GHz band. They envisage that this band will be used for applications such as holographic projections, super multiview displays, VR and Giga Wi-Fi in press centers, airports, conference halls and the like, and hope to begin commercial services in 2020.

In research and development, through the efforts of 5G R&D projects (the Core Technology Project and Giga Korea Project), there are plans to invest \$490 million by 2020, and for the creation of new 5G markets, the participation of small and medium-sized

enterprises is being encouraged and the transfer of technology is also being supported.

In February 2016, four companies — KT, NTT DOCOMO, SK Telecom and Verizon — co-founded the 5G Open Trial Specification Alliance to promote cooperation between companies performing 5G verification trials.

In January 2017, the K-ICT frequency plan was announced with the aim of ensuring the availability of frequencies for commercial 5G services. By around 2018, South Korea plans to allocate the 27.5–28.5 GHz (or 26.5–28.5 GHz, depending on the status of device development) and 3.4–3.7 GHz bands.

## 2.4 China

At the Mobile World Congress (an international event covering 5G and other technologies that was held in June 2016), China Mobile announced its intention to implement 5G services by 2020. The Chinese Ministry of Industry and Information Technology announced that research, development and testing of 5G technology would take three years from 2016 through 2018.

China Mobile and Huawei are both promoting efforts to implement 5G services in collaboration with NTT DOCOMO.

## 3. Partnerships between Japan and other countries

Towards the implementation of 5G by 2020, 5G promotion organizations are being established through cooperation between industry, academia and governments in the world’s leading countries and regions in the same way as the 5GMF in Japan (see Figure. 2). Each organization is publishing white papers summarizing the usage fields and technical issues of 5G, and is promoting research and development efforts.

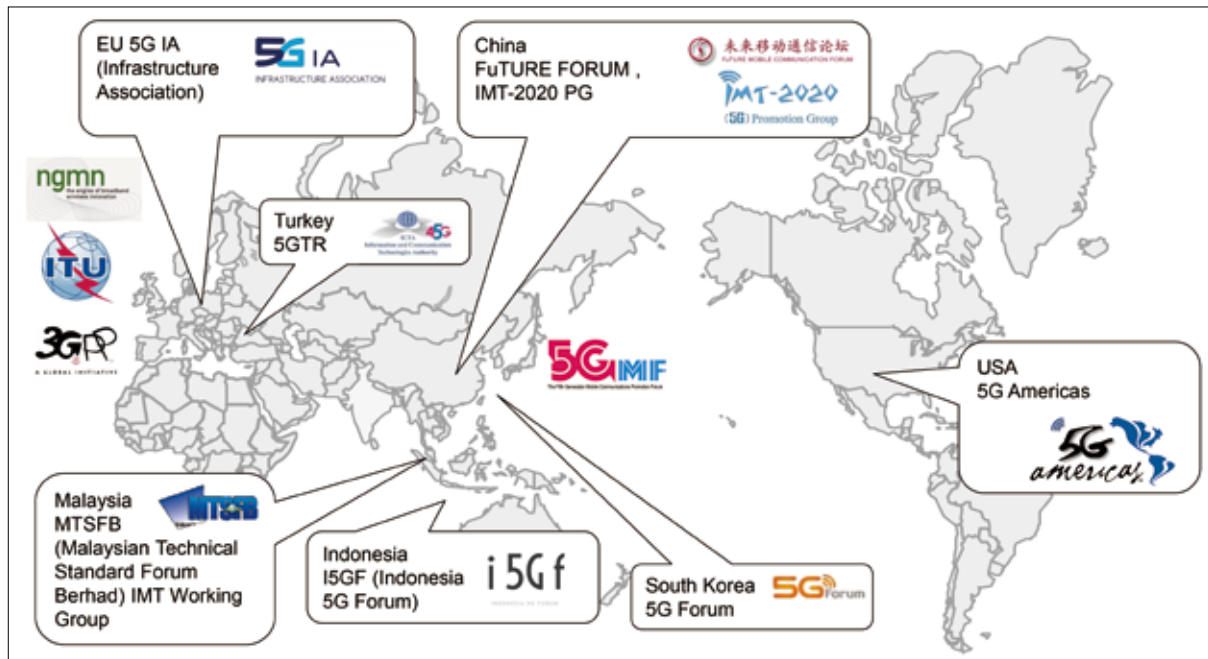
To strengthen international cooperation between organizations, the 5GMF has been holding workshops and setting up memoranda of understanding (MoUs) (Figure. 3). In particular, the 5G promotion organizations of Europe, the US, China and South Korea (5GIA, 5G Americas, IMT-2020 PG and the 5G Forum) have entered into a multilateral MoU, on the basis of which each region will take turns to hold a biannual Global 5G Event. The first such event took place in Beijing in May 2016, and the second was held in Rome in November. In May this year, the third of these events is due to be held in Tokyo.

## 4. Final report of the Radio Policy 2020 Study Group

The Radio Policy 2020 Study Group was opened by the Senior Vice-Minister for Internal Affairs and Communications between January and July 2016, and studied promotion policies aimed at the realization of new mobile services including 5G and next-generation ITS (Intelligent Transport Systems).

In its final report of July 2016, 5G is positioned as the ICT platform for the IoT era in which the circulation of vast quantities of diverse kinds of data concentrated in the cloud. The report presents nine fields of use, three projects and nine promotion models, and concludes that the promotion of these projects will accelerate efforts to realize 5G by 2020. This article summarizes

■ Figure 2: 5G promotion organizations in each country and region



■ Figure 3: International cooperation activities in 5GMF

**Cooperation with 5G promotion organizations (creation of MoUs, etc.)**

- Cooperation with Europe: MoU with the 5G Infrastructure Association @Frankfurt, March 2015
- Cooperation with Korea: MoU with the 5G Forum @Tokyo, April 2015
- Cooperation with Indonesia: MoU with the Indonesian 5G Forum @Bali, September 2015
- Japan/Europe/US/China/South Korea Alliance: Multilateral MoU with 5G Infrastructure Association (Europe), 5G Americas (USA), 5G Forum (South Korea) and IMT-2020 (5G) Promotion Group (China) @Lisbon, October 2015
- Cooperation with Malaysia: Agreement (MoC) with IMT Sub-WG 5G @Cyberjaya, April 2016
- Cooperation with China: MoU with the IMT-2020 (5G) PG @Beijing, June 2016

**Holding international conferences, etc.**

- Japan–Europe 5G Symposium @Hiroo, February 2016: Held jointly with the French embassy in Japan, and the Delegation of the European Union
- CEATEC 5G workshop @MakuhariMesse, October 2016
- Global 5G event (2nd) @ Rome, Italy, November 2016
- Japan–Turkey 5G workshop @Ankara, Turkey, January 2017



Photo (left): Japan–Europe 5G Symposium



Photos (center, right): The Global 5G Event

the 5G final report of the Radio Policy 2020 Study Group.

Prior to 4G, services were centered around the distribution of information to devices such as smartphones and tablets. On the other hand, 5G not only provides eMBB, but also facilitates Ultra-Reliable Low-Latency Communications (URLLC) and mMTC to large numbers of sensors and terminals, and is expected to be

used in a much wider diversity of fields including automobiles. Achieving horizontal development in the following nine fields is vital for the spread of 5G.

- (1) Sports (fitness, etc.)
- (2) Entertainment (games, tourism, etc.)

- (3) Offices / workplaces
- (4) Medical care (healthcare, nursing)
- (5) Smart houses / daily life (daily necessities, communications, etc.)
- (6) Retail (financing, payments)
- (7) Agriculture, forestry and fisheries
- (8) Smart cities / smart areas
- (9) Traffic (passenger transport, freight distribution, etc.)

To further develop these nine fields, cooperation with diverse utilization fields is essential from the stage of R&D and verification before a system is introduced, rather than going ahead with horizontal deployment from the stage where 5G is implemented. Therefore, to achieve the early deployment of 5G in these nine fields, based on the main requirements of 5G (mMBB, mMTC, and URLLC), it was shown that three projects should be promoted: ultra-broadband, wireless IoT, and next-generation ITS (see Figure. 4).

With regard to these three projects, three specific “promotion models” were shown simultaneously for each project (see Fig. 5). For the advancement of future projects, it is essential to construct an implementation system involving not only communication providers and the vendors of communication equipment, but also

the users of this technology, and to consider the specific contents of these projects.

In the promotion of these projects, actions were taken from the following four viewpoints:

- (1) Strategic R&D and verification: It is important to promote R&D focused on key technologies, and to conduct R&D and verification based on strategic cooperation with other countries as in European joint studies.
- (2) Environmental improvements aimed at business expansion: Systems and maintenance should be studied at the same time as research and development, and frequencies should be reserved by taking factors such as international harmony and ease of social implementation into consideration.
- (3) Deployment in regions that contribute to regional stimulation, etc.: Open test beds that allow a wide diversity of stakeholders to get involved have been set up not only in Tokyo but in all regions, and such measures have contributed to regional revitalization and local creation.
- (4) National standardization and international development: We will promote ongoing strategic national standardization and international development in partnership with 5GMF stakeholders and other related

■ Figure 4: Promotion and uptake of next-generation mobile service implementation projects

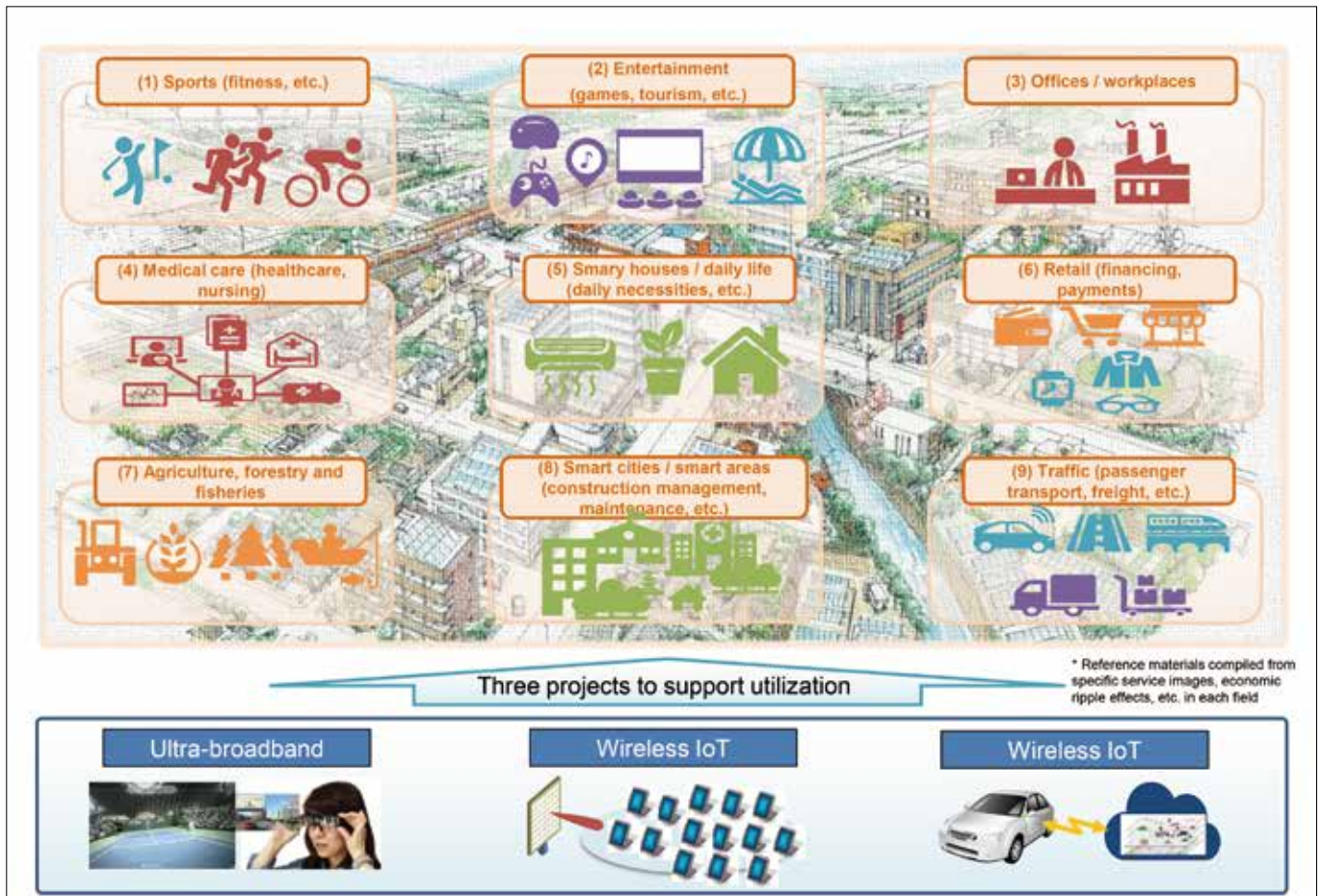


Figure 5: Nine promotion models

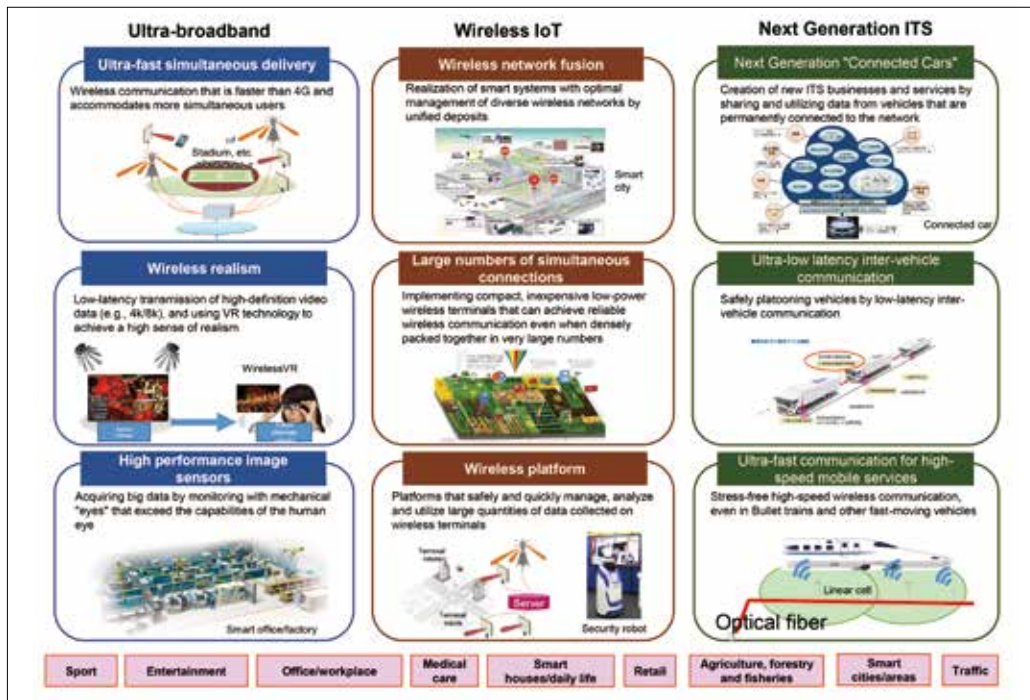
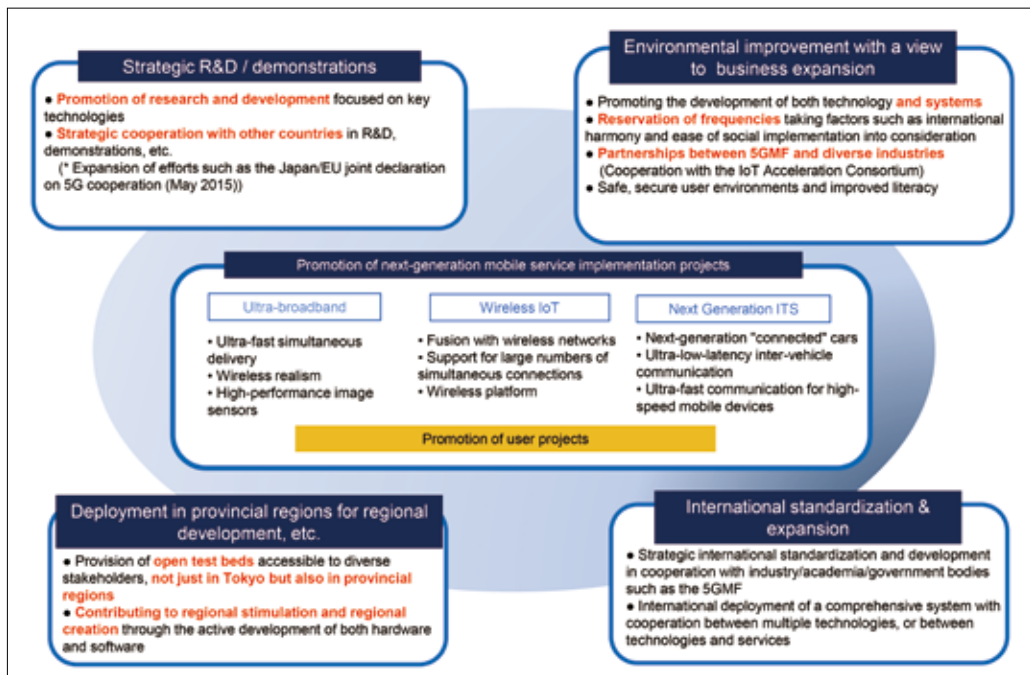


Figure 6: Comprehensive project promotion measures



individuals from industry, academia and government, and the international expansion of a comprehensive system that links technologies and services.

Based on feedback from users, we also expect that promotion efforts coupled with a fast PDCA cycle will help with the resolution of issues facing society and with the creation of new value in the 5G era.

## 5. Conclusion

Based on these recommendations at the Radio Policy 2020 Study Group, the Minister for Internal Affairs and Communications asked the Information and Communications Council to study the technical specifications of Next-Generation Mobile Communication Systems in October 2016. From the 2017 fiscal year, comprehensive trials are due to be held based on the above three projects.