Promotion of Public-Private-Academic Engagement in Meteorological Services

Meteorological Subcommittee, Council of Transport Policy

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Outline

Introduction

Chapter 1: Changes in social environments and meteorological services
- (1) Changes in social environments
- (2) Changes in meteorological services
- (3) Overseas

Chapter 2: Meteorological service provision by public-private-academic sector operators
- (1) Meteorological service ideals
- (2) Public-private-academic sector relations

Chapter 3: Further promotion of public-private-academic engagement
- (1) A forum for public-private-academic dialogue: role sharing and enhanced collaboration
- (2) Exchange and development of human resources: sharing of technology and expertise
- (3) Joint-project promotion via public-private-academic engagement
- (4) New environments for meteorological information using cloud computing technology: data distribution and sharing

Conclusion

Introduction

Today's rapid progress in the field of information and communication technology (ICT) represents the arrival of a data-driven society, and new technologies supporting meteorological services have emerged as a result. Public need for such services is also increasing and diversifying against a background of more frequent and extreme disasters, along with a greater general awareness of disaster risk reduction.

To meet these needs, the Japan Meteorological Agency (JMA) and universities/research institutes conduct meteorological research and technological development as a basis for the issuance of related information. Private meteorological service providers also make various efforts in the field, and the utilization of weather data by other companies is also advancing. In light of the various changes and trends seen in recent years, the Meteorological Subcommittee under the Council of Transport Policy has engaged in discussions on the promotion of public-private-academic engagement in meteorological services.

The Sub-Committee's 2018 proposal, titled Scientific/Technological Application in Meteorological Service Toward 2030, states that JMA and various other organizations should contribute to the realization of a safe, resilient and vibrant society in which individual life and property are protected and people enjoy flexible, active and vibrant lifestyles. To these ends, data from JMA and meteorological service providers should be utilized on the basis of technological development for improved observation/forecasting accuracy and the promotion of such information for practical application. JMA assumes a central role in promoting the contribution of meteorological services in the field of disaster risk reduction. For appropriate response to today's rapidly changing social environment and to ever-greater and diversifying public need, it is important to maximize the positive effects of meteorological services as a whole by mobilizing the collective efforts of the public-private-academic sector.

The promotion of such efforts requires clarification of the basic roles to be played by the public and private sectors. The division of these roles was summarized in the 1992 Report No. 18 of the Meteorological Council (the organization's previous title), based on which various entities contribute to meteorological service development. To meet growing expectations relating to social environment changes, it is necessary to establish public-private-academic collaboration with sharing of roles based on related concepts.

The Sub-Committee has deliberated four times on the relationships to be established among the three sectors in the field of meteorological services, and on measures to be taken by JMA to promote related collaboration. The results were compiled as recommendations to JMA.

Chapter 1: Changes in social environments and meteorological services

As per the Meteorological Service Act, meteorological services include observation of weather events and other phenomena, the collection and publication of related results, the issuance of forecasts, warnings and information, and the performance of research as a basis for such activities. JMA plays a central role in meteorological services, with universities and research institutes also engaging in research and development. The results are utilized by JMA and private meteorological service providers[1] in supplying a wide variety of information for public consumption.

Today's rapid advances in ICT development underpin the progress of various socioeconomic activities based on data. There is also increasing public awareness of the need for disaster risk reduction against an increasing frequency of weather-related disaster conditions. Public-private-academic relationships in various fields are also evolving, with the government supporting the efforts of the public and academic sectors and meteorological services changing in response.

This chapter summarizes changes in social environments and meteorological services, and also provides an overview of overseas developments in public-private-academic relations for the provision of such services.

(1) Changes in social environments

(a) A full-scale data-driven society based on rapid ICT progress

The rapid process of ICT in recent years has supported the development of artificial intelligence (AI) and IoT technology (which enables interconnection among various appliances and terminals), as well as enabling efficient collection and application of big data from sensors and various other sources. The Fifth Science and Technology Basic Plan (approved by Japan's Cabinet in 2016) proposes the ideal of a future super-smart Society 5.0 based on the expansion of ICT usage to various fields. The Basic Act on the Advancement of Public and Private Sector Data Utilization was enacted in 2016, and the

[1] Companies mainly engaged in the public provision of weather information and meteorological consultancy services

Basic Plan for the Advancement of Public and Private Sector Data Utilization was compiled in 2017 toward a society enriched by data application. Against this background, the government actively promotes initiatives for the provision of public data, while the public and private sectors collaborate on data utilization. These efforts have underpinned the development of a truly data-utilizing society.

This work has produced numerous examples of contribution to the resolution of social issues via the use of public data.

(b) Increased disaster frequency and severity

In recent years, heavy rainfalls such as the Heavy Rain Event of July 2018 and the Heavy Rain Event of July 2020 have caused serious disasters in Japan. Typhoon Faxai (2019), Typhoon Hagibis (2019) and others have also created extreme conditions, in addition to earthquakes and volcanic disasters including the 2018 Hokkaido Eastern Iburi Earthquake and the 2014 Mount Ontake Eruption. Numerical prediction models indicate that the frequency of heavy rain events and short-duration concentrated downpours will increase further with global warming, and that tropical cyclones such as typhoons may also intensify. There are also concerns regarding potential volcanic eruptions and tremors such as the expected Nankai Trough Mega Earthquake and the Tokyo Inland Earthquake, which could cause tremendous damage.

Typhoon Hagibis (2019) caused extensive flooding in Shinkansen train depots, factories and commercial warehouses. The frequency and severity of such disasters has underpinned a growing awareness of the need to mitigate weather risks in corporate activities, and the need for weather-related services is therefore expected to increase.

(c) Changes in public-private-academic sector relations

All these sectors have long worked together to fulfill their respective roles and missions. However, various systemic changes in recent years have created growing momentum for social innovation based on the strengths of the private and academic sectors, and the relationships among the three sectors change constantly. A variety of public-private-academic engagements have also emerged, for example; some public services that have conventionally been funded by the national government are now supported by private-sector funding and expertise; the government has created new commercial opportunities

in the private sector; public, private and academic operators collaborate to promote R&D efforts ranging from basic research to social implementation; the government supporting overseas development of infrastructure technologies. Against the backdrop of today's challenging financial situation, there is also strong demand for more effective administrative management.

(2) Changes in meteorological services

(a) Increased volumes of meteorological information

In recent years, observation and forecasting technologies have become increasingly sophisticated due to advances in meteorology and ICT. JMA's numerical weather prediction (NWP) models have become ever-more advanced, with the introduction of local forecast model featuring a horizontal grid spacing of 2 km (capable of representing phenomena with horizontal scales of tens of kilometers or more, such as characteristic cumulonimbus clouds causing torrential rain) and meso-ensemble forecasts (capable of probabilistically capturing the potential for extreme weather phenomena such as heavy rain and storms causing disaster conditions). Various data are provided to support public wellbeing, including meteorological and oceanographic information as well as yellow sand, ultraviolet and solar radiation data.

The volume of meteorological information made public by JMA via the Japan Meteorological Business Support Center (JMBSC) under the Meteorological Service Act grew from around 2.8 GB per day in 2006 to about 178 GB per day in 2019, representing a 60-fold increase.

In the wake of the Heavy Rain Event of July 2020 and other extreme phenomena, there is a need for greater forecast accuracy with stationary linear mesoscale convective systems. Forecasts with greater detail and more sophisticated probability information will also be required in the future. Weather information is expected to become increasingly diverse and voluminous to meet such demand.

(b) New technologies applicable to meteorological services

As detailed above, efforts are being made to apply advancing AI and IoT technologies to

meet today's increasing and diversifying need for meteorological services.

To improve observation and forecast accuracy, JMA conducts joint research on AI technology application in collaboration with the Institute of Physical and Chemical Research (RIKEN). Efforts are also made toward improved guidance technology to correct NWP model calculations using statistical methods, and toward quality control technology for observation data. Private-sector operators [2] also work to develop technologies for weather forecasting and rainfall prediction using AI technology, and IoT sensors are now used to observe actual weather conditions at points where monitoring was previously impractical.

Efforts are thus made to utilize the results of non-meteorological technological development in meteorological services. Future upgrades of such services are expected from the outcomes of this work.

(c) Improvement of meteorological information for disaster mitigation and enhancement of related response/support from JMA

In response to today's greater disaster frequency and extremity, JMA works to improve meteorological information for mitigation measures utilizing the latest technology to support national and local government bodies and the public. As per the recommendations of Science/Technological Application in Meteorological Service Toward 2030 (a report from the Meteorological Subcommittee under the Council of Transport Policy), there is a need to improve the accuracy of prediction for stationary linear mesoscale convective systems and typhoon paths, and to provide information on the spread of seismic tremors and temporal trends of tsunamis. In response to concerns over increasing weather risks and potential earthquakes and volcanic disasters, JMA has a duty to focus on further upgrading of meteorological information for disaster mitigation to protect life and property.

The proposal also highlights a need to raise public awareness of disaster mitigation measures in direct relation to life and property in Japan, and specifies that JMA should

[2] The companies referenced here include meteorological service providers, meteorological observation equipment manufacturers, IT-related businesses and operators utilizing meteorological information from JMA and other private meteorological service providers.

play a central role in contributing to meteorological services based on its status as a national agency. It is important to establish and develop direct relations between local disaster management agencies and JMA local field offices, and to promote efforts for disaster management and support, such as work by the JMA Emergency Task Team (JETT). This is expected to enable the accurate use of sophisticated meteorological information for disaster management.

(d) Promotion of meteorological information usage in the private sector

Since 1995, when parties other than JMA were first allowed to produce weather/wave forecasts for the general public, the scope of authorization has been gradually expanded to include seismic and volcanic phenomena, tsunamis and storm surges in accordance with technological progress. The creativity and ingenuity of private meteorological service providers have greatly enhanced the types and quality of meteorological services provided to the public in Japan.

The advent of a full-scale data-driven society has been accompanied by improved observation/forecast accuracy and efforts to promote public/private-sector usage of weather information via the Weather Business Consortium (WXBC) and other organizations. As a result, meteorological information is now used in the conventional fields of electricity, transportation and agriculture, as well as in a variety of other fields such as logistics and retail. Such information is often used in combination with other data related to commercial operations and utilized for related decision making.

Accordingly, the private sector is expected to take on a greater role in response to increasing and diversifying needs for meteorological services, and to provide meteorological services that are more tailored to user demand. It is therefore essential that public-private-academic sector operators share related roles, and that meteorological service providers work together to ensure that meteorological information is used as part of society's soft infrastructure.

(3) Overseas

The work conducted by the private sector in meteorological services has become indispensable worldwide in recent years. This is exemplified in Europe, the United States and elsewhere by well-financed private-sector implementation of meteorological

observation work that used to be conducted under national programs. In the United States, the U.S. National Oceanic and Atmospheric Administration (NOAA) and private cloud-data providers have partnered up, and efforts are being made to provide users with large amounts of data utilizing cloud service providers' infrastructure. The various examples of public-private-academic engagement seen include efforts to further improve forecast accuracy using private observation facilities.

With the rapidly growing role of the private sector in meteorological services, the World Meteorological Organization (WMO) published the WMO Policy Framework on Public-Private Engagement in 2018, with a 2020 revision to create the Guidelines for Public-Private Engagement. Under the latter, the public sector is tasked with undertaking long-term projects and investment in core infrastructure, while the private sector is responsible for leveraging the latest technologies and engaging in dynamic investment to meet particular consumer needs. In public-private-academic engagement, it is important to ensure shared values and create win-win situations. Specifically, this is achieved via public sector utilization of private sector expertise, promotion of technology and data sharing, acceleration for public implementation of R&D results, and investment in human resource development. The report also suggests that public-private-academic sector operators should pursue opportunities for inter-collaboration to improve efficiency, realize better services and ensure sustainability in meteorological data provision, while embracing synergies and minimizing redundancy.

The importance of public-private-academic engagement in public contribution via meteorological services is recognized worldwide, and related efforts made to date provide examples for the development of meteorological services. This can be achieved in consideration of social environment changes by building relationships in which public-private-academic sector operators share values and synergies based on their respective strengths.

Chapter 2: Meteorological service provision by public-private-academic sector operators

As per Chapter 1, social environments have changed drastically in recent years, and meteorological services have developed in response. In this context, such services should contribute to the realization of a safe, resilient and vibrant society in which individual life and property are protected and people enjoy flexible, active and vibrant lifestyles as suggested in the Science/Technological Application in Meteorological Service Toward 2030 recommendation of the Meteorological Subcommittee under the Council of Transport Policy. Appropriate response to increasing and diversifying needs for meteorological services requires all parties involved in meteorological services (including the public-private-academic sector) to understand the issues at hand in society, the goals and directions that meteorological service providers should pursue. It is also important to strengthen cooperation by sharing meteorological information, data, technology and expertise, and to build relationships that support the mobilization of human resources, funding and other resources for a collaborative response.

This chapter outlines ideals for meteorological service provision by public-private-academic sector operators.

(1) Meteorological service ideals

Ideals for meteorological services are outlined in the Meteorological Subcommittee report titled Scientific/Technological Application in Meteorological Service Toward 2030. The publication proposes specific goals based on technological innovation with ongoing incorporation of the latest research results. This approach is intended to ensure that observation and forecasting technologies are constantly improved, and that meteorological information can be used in various aspects of everyday life as an indispensable part of soft infrastructure and public property. This is expected to contribute to the realization of a safe, resilient and vibrant society.

The role played by academia in scientific and technological development is indispensable in improving the accuracy of observations and forecasts. The private sector, with which data users may be more familiar, is also important in promoting the utilization of meteorological information. The development of meteorological services requires

enhanced collaboration among public-private-academic sector operators.

(2) Public-private-academic sector relations

For appropriate response to today's rapidly changing social environment and to ever-greater and diversifying public needs, discussions have been held to maximize the positive effects of meteorological services as a whole by mobilizing the collective efforts of the public-private-academic sector. This section covers analysis of public-private-academic associations in relation to changes in meteorological services, including how engagement of the relevant parties in such services should be developed to build win-win relationships and respond to changes via mutual efforts.

JMA plays a central role in the implementation of meteorological services along with private providers, universities and research institutes in related fields. Recent years in the private sector have seen meteorological service providers joined by private operators engaging in various activities utilizing meteorological information in the form of big data. The academic sector has recently seen enhanced activity in research on the application of cutting-edge AI technology, as well as in fields closely related to weather and climatic conditions. The number of organizations involved in meteorological services in national and local government bodies is growing in response to the expansion of meteorological services addressing areas such as disaster mitigation, global warming, and fields affected by weather and climate conditions.

The resolution of social problems in the expanding field of meteorological services requires collaboration with private providers, universities and research institutes in related fields, as well as with parties involved in ICT and other cutting-edge technologies, end users of meteorological information, and national and local government agencies related to meteorology.

Paramount importance is placed on the roles of overseeing and coordinating meteorological services to promote collaboration among public-private-academic sector operators while leveraging their respective strengths. JMA plays a major role in this regard as a key figure in meteorological services in Japan. In addition to its core role of providing and upgrading disaster-mitigation meteorological information and promoting disaster preparedness and support in cooperation with local governments and related

organizations, the Agency also contributes to socioeconomic activity ensuring that the efforts of the public-private-academic sector are effectively implemented, and fulfills its function to optimize meteorological services provided by various entities. JMA is also tasked with the steady promotion of development in meteorological observation and NWP modeling, as well as the maintenance of a platform for the sharing of meteorological information, data, technology and expertise. This is expected to serve as a basis for meteorological services provided by various entities in all three sectors.

Promoting public-private-academic sector collaboration requires a clear division of roles between the public and private sectors in meteorological services as outlined in the 1992 Report No. 18 of the previously named Meteorological Council. The report highlights JMA's responsibility for issuing warnings and other disaster mitigation-related meteorological information to protect life and property, and for issuing weather forecasts and other essential information for public consumption. JMA is also tasked with providing basics such as numerical forecasting data referenced in the provision of such information to support private meteorological services, which are expected to provide a variety of value-added meteorological applications fulfilling demand for advanced information technology. Accordingly, such providers represent an important contact with the public. This division of roles remains effective, and JMA must realize effective administrative management in the field of public-private-academic engagement for future promotion.

Previous meteorological services have involved an overall duplication of meteorological service efforts by the public-private-academic sector, and related work has not necessarily been effective. One of the backgrounds of this issue is social issues, goals and directions to be pursued for services as a whole, and JMA technologies and expertise were not shared among stakeholders. To address this situation and realize the ideal vision of meteorological services, related parties must engage in ongoing dialogue, share information closely, work to enhance mutual understanding, and optimize the use of valuable resources (such as technology, expertise, human resources and funding) to meet public needs.

Chapter 3: Further promotion of public-private-academic engagement

Societal changes and corresponding developments in meteorological services in Japan suggest a need for enhanced public-private-academic sector collaboration, as well as collective efforts toward an ideal state for such services.

Despite public-private-academic collaboration on such services, some disparity is observed in relation to information on public needs to be addressed and goals/directions to be pursued. Meteorological services as a whole have also not been promoted effectively. As the scope of such services expands, it is necessary to promote public-private-academic sector collaboration in areas including cutting-edge technologies such as ICT and among users of various meteorological information types.

This chapter describes related measures to be taken by JMA in the promotion of public-private-academic engagement toward positive synergies in meteorological service work such as observation, forecasting, technological development and promotion of utilization, as well efficient application of resources.

(1) A forum for public-private-academic dialogue: role sharing and enhanced collaboration

Public-private-academic sector operators involved in meteorological services in Japan collaborate on service development. Future enhancement of this work depends on ongoing and improved dialogue among the parties involved, close sharing of information, enhanced inter-awareness and discussions on problem resolution. Such development as a whole requires the establishment of a forum for ongoing interaction among related parties toward optimization of technology, expertise, human resources, funding and other resources to meet public needs.

Against this background, the establishment of the provisionally named Council for the Promotion of Public-Private-Academic Engagement in Meteorological Services (“the Collaborative Council”) creates a wide-ranging discussion forum for issue resolution by parties involved in meteorological service provision.

The first step in such dialogue involves ensuring that the parties concerned understand

specific plans for improving JMA meteorological information intended for disaster mitigation, development of related technologies, provision of meteorological information produced, and system equipment maintenance. This is expected to facilitate private and academic sector operators planning the development of meteorological services and formulating research plans for public implementation, as well as efficient use of resources. The initiative will also help JMA to consider the status and opinions of private and academic sector initiatives in the development and improvement of its own plans. In this way, JMA and public-private-academic sector parties involved in meteorological services will be able to share expertise gained from their efforts. The resulting clarification of an ideal road map for meteorological service provision as a whole will support public-private-academic sector operators in the field toward efficiency and expansion for even greater public contribution.

Specific themes to be considered in dialogue should be supported by a subcommittee of related parties toward policy formulation and issue resolution. Such themes may include exchange and development of human resources, promotion of joint public-private-academic projects, establishment of environments for sharing of essential meteorological information, and systems for the implementation of meteorological services. Theme setting should also be based on versatile understanding of societal changes.

Due to the expansion of meteorological services, a greater number of related public-private-academic operators, and a larger body of service providers stemming from meteorological information availability, there is a need for a mechanism enabling interaction between end users of such information and the Collaborative Council.

The establishment and operation of the Council requires clear guidelines on its purpose and roles in relation to existing forums for interaction among parties involved in meteorological services, including those in the private and academic sectors, to ensure effective collaboration overall. Council activities also need to be transparent to support public understanding, and a forum where related parties can engage in discussions is needed. It is important for public-private-academic sector operators to discuss matters regularly so that issues can be resolved promptly and the results of research in various fields at universities and research institutes can be utilized in meteorological services.

(2) Exchange and development of human resources: sharing of

technology and expertise

The optimization of public contribution from meteorological services requires sharing in relation to public-private-academic sector needs. This includes openness regarding JMA technology and expertise associated with observation and forecasting in the private and academic sectors, and promotion for application of results from cutting-edge research conducted by universities and research institutes associated with the operations of JMA and private companies.

The effective promotion of such activities requires human resource mobility via exchanges among JMA and public-private-academic sector operators. JMA's limited engagement in previous exchanges involving the public and private sectors suggests a need for more active engagement to promote cutting-edge expertise from its operations and to share technology and know-how. The interpersonal networks developed through these exchanges are expected to widely support collaboration in meteorological service provision.

Joint efforts in human resource development should be made by public-private-academic sector operators. The technologies and expertise required in meteorological service provision are common to all such operators, who should collaborate to develop human resources via joint implementation of previously independent training programs. This will support more efficient staff development and fostering of interpersonal networks in meteorological services.

Given today's decline in the working-age demographic, public-private-academic sector operators involved in meteorological services must make effective use of related human resources via enhancement of internship systems and efforts to increase interest in such services among the younger generation. It is also important to create opportunities for certified weather forecasters in Japan, who represent valuable human resources in the meteorological service community. To broaden the scope of meteorological data utilization and promote more effective application, there is also a need to promote expertise in combining and analyzing meteorological information with other types of business-related data and utilizing the results for commercial decision-making. WXBC efforts to train meteorological data analysts for such utilization need to be bolstered by related public-private-academic sector collaboration.

(3) Joint-project promotion via public-private-academic engagement

Public-private-academic sector entities involved in meteorological services have conventionally operated independently. JMA has generally conducted observation, issued forecasts and warnings, and developed technologies for related activities under its own initiative, while private meteorological service providers have generally catered to user needs based on JMA data. In recent years, however, private meteorological service providers have greatly enhanced their output, and the number of such operators with access to a wide variety of technologies and expertise has increased. This has created an environment in which JMA and private providers can engage in joint development. Public demand for meteorological services is also increasing and diversifying, and related data are increasingly utilized in various ways. Collaboration between the national government (tasked with disaster mitigation and public service) and the private sector (providing meteorological services to meet a range of needs) will enable more diverse contribution to society.

In the academic field too, potential for collaboration has emerged not only in the field of meteorology but also in a wider range of academic fields, including ICT and other areas significantly affected by weather and climate conditions.

Accordingly, public-private-academic engagement is considered capable of producing unprecedented results by maximizing the use of individual parties' resources (e.g., technology, expertise, staff and funding) and by promoting joint projects with a common objective.

In collaboration with private operators, a push-type service is being developed to notify the public of increased risk from disaster conditions such as flooding and landslides. In the seismic and volcanic categories, observation networks are being developed in cooperation with universities and research institutes. The government is expected to enhance its observation system by integrating related data from public-private-academic sector operators, utilize the results of cutting-edge research in areas such as AI conducted by universities and research institutes in meteorological services, and develop new markets via joint development of meteorological forecasting models and guidance technologies. Overseas development based on packaging of public and private projects is also keenly anticipated.

Joint-project promotion depends on discussion of specific details, including the selection of initiatives to be implemented, the division of roles/financial burdens in project iteration, and the handling of intellectual property rights. Such discussion needs to be conducted via the Collaborative Council based on the requirements and policies of individual entities.

(4) New environments for meteorological information using cloud computing technology: data distribution and sharing

Meteorological information forms the basis of weather services and socio-economic activities engaged in by various entities, thereby representing an important element of soft infrastructure. Basic data (such as observation results and numerical forecasts produced by JMA for its public services) are currently provided in accordance with the Meteorological Service Act to the Japan Meteorological Business Support Center (JMBSC), which makes the information widely available to the public for various purposes. However, the variety and volume of data available has increased dramatically in recent years, and the efficiency of conventional distribution channels is diminishing. The provision of such information as part of soft infrastructure and the promotion of related utilization requires a change in perception regarding distribution and sharing, as data volumes will only continue to increase. This also applies to public data, including the significant body of information in JMA's archives.

Meanwhile, the progress of ICT has brought great advances in cloud technology, which is now used to archive and share large amounts of data efficiently. Private and academic sector operators involved in meteorological services often store large volumes of data in the cloud. In the United States (Chapter 1 (c)), efforts are being made to share large amounts of meteorological data via the infrastructure of cloud-data providers for related operations.

JMA should also establish an environment for the sharing of today's burgeoning amounts of meteorological information using cloud computing technology with careful consideration of related security. This will enable efficient sharing without the need for individual agencies to have their own data, and will also promote research and technological development in the private and academic sectors by expanding the range of meteorological information available. Such sharing is also expected to lead to new

meteorological services as well as supporting related joint research, technological development and meteorological service advancement. Expanded use of cloud computing for data storage by related organizations will help to promote collaboration in associated usage.

It is therefore important to establish an environment for meteorological information sharing to leverage public-private-academic sector strengths in resolving social issues, with related costs borne to a reasonable extent by users. As such an environment will benefit all three sectors, it is necessary to leverage opportunities provided by cooperative councils to discuss specific systems, operational policies (such as maintenance services, sharing of past data, use of JMA programs in a cloud environment, setting the fee for such use), and those related to intellectual property rights and secondary use, in full consultation with relevant parties.

Conclusion

The frequency and severity of disasters observed in recent years has raised public awareness of the need for disaster mitigation efforts, thereby creating unprecedented demand for improved prediction accuracy. In the post-coronavirus era, digitalization will lead to further progress in a data-driven society, and the need for meteorological services will increase.

In FY 2020, JMA reorganized and established the position of Deputy Director-General for Disaster Mitigation to handle advanced coordination of meteorological disaster mitigation operations. The Information Infrastructure Department, which is responsible for JMA services relating to NWP and meteorological satellite observation (the basis of meteorological information) was also established, along with support for widespread public utilization of meteorological data. As part of efforts to forge ahead with inter-sectoral collaboration, the Commission for the Promotion of Public-Private-Academic Engagement was formed within JMA, and a system was established to support interaction among public-private-academic sector entities involved in meteorological services.

In light of changes in the related environment and meteorological services, the new structure is expected to support JMA's establishment of relationships with public-private-academic sector operators under the measures outlined in this proposal. The Agency will also promote the realization of a safe, strong and vibrant society in which individual life and property are protected and people lead flexible, active and vibrant lifestyles as specified in the Scientific/Technological Application in Meteorological Service Toward 2030 report.