Document 3-2

Objectives concerning the Administration of the Operations to Be Achieved National R&D Agency Japan Agency for Marine-Earth Science and Technology (Mid to Long-term Objectives) (Draft)

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Ministry of Education, Culture, Sports, Science and Technology

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* Each of items in III-1 and III-2 is categorized as a group of research projects.

In accordance with the provisions of paragraph (1) of Article 35-4 of the Act on General Rules for Incorporated Administrative Agencies (Act No. 103 of 1999), objectives concerning the administration of operations (hereinafter referred to as the "mid to long-term objectives") to be achieved by national research and development agency Japan Agency for Marine-Earth Science and Technology (hereinafter referred to as the "Agency") are set.

I Position and role of the Agency in the policy system

The Agency aims to enhance marine science and technology standards and make contribution to the development of academic research by conducting fundamental R&D on the oceans and cooperating for academic research on the oceans in a comprehensive manner based on the principles of peace and welfare.

In the 5th Science and Technology Basic Plan (decided by the Cabinet on January 22, 2016), marine science and technology is considered as part of science and technology which will produce great values critical for national strategy. In the 3rd Basic Plan on Ocean Policy (decided by the Cabinet on May 15, 2018), enhancement of scientific knowledge is always considered as one of the Agency's major initiatives to be implemented, and therefore, efforts for ensuring full maritime security, including the establishment of a Maritime Domain Awareness (MDA) system, and provisions for promoting Japan's Arctic Policy were newly added to its working agenda. In particular, R&D is essential for achieving the goal of Society 5.0 even in the field of oceanographic science, for instance, by creating new values using artificial intelligence (AI) and obtaining the capacity for big data analysis by developing the relevant technology based on an enormous amount of oceanographic information collected in oceanographic survey and observation system and utilizing the results for economic development and solutions to social issues.

With regard to international situations, the control, conservation and sustainable use of the oceans and marine resources were included in the Sustainable Development Goals (SDGs) (UN Sustainable Development Summit in September 2015), in the G7 Ise-Shima Leaders' Declaration (May 2016), in the communiqué of G7 Science and Technology Ministers' Meeting in Tsukuba (May 2016), and in Decade of Ocean Science for Sustainable Development (2021-2030) (proclaimed at the 72nd UN General Assembly in December 2017). This indicates that the importance of the oceans has become a common understanding both in Japan and abroad. In consideration of the importance of Arctic region in international society, the Arctic Science Ministerial has been held every year since 2016, and the 3rd ministerial meeting in 2020 is scheduled to be held in Japan.

Under these circumstances, the Subdivision on Maritime Science of the Council for Science and Technology, Ministry of Education, Culture, Sports, Science and Technology (MEXT) formulated a research and development plan on marine science and technology (in January 2017; and revised in January 2019; hereinafter referred to as the "R&D Plan") to

clarify the fields of marine science and technology to be promoted and policies of promotion by the MEXT.

The Agency has produced distinguished outcomes in various fields of marine science and technology. In this period of mid to long-term objectives, it is also expected to play a major role as a core institution for marine science and technology in Japan by taking into consideration changes in domestic and international situations and accompanying issues as described above, and contribute to creating, disseminating and deploying high outcome levels through oceanographic observation and various R&D projects by taking advantages of the strength of the Agency which owns and operates a number of research vessels and equipment. In this regard, an innovative collaboration system is expected to be established to maximize R&D outcomes in marine science and technology in Japan as a whole, in addition to the optimization of work assignment and joint efforts to strengthen the current collaboration with other agencies. At the same time, efforts to improve the quality and pool of skilled and insightful human resources also need to be promoted for continuing R&D on the oceans in the future and contributing to the sustainable development of marine science and technology.

II Period of mid to long-term objectives

The period of the mid to long-term objectives of the Agency is seven years from April 1, 2019 to March 31, 2026.

III Matters concerning maximization of R&D achievements, and improvement of the quality of other operations

1. Promotion of fundamental R&D in marine science and technology

According to the 5th Science and Technology Basic Plan, the 3rd Basic Plan on Ocean Policy, and so on, the Agency needs to challenge the following issues to further expand its efforts for development in the future:

- Solving economic and social issues including the conservation and sustainable utilization of global environment, and response to ocean originated natural disasters
- Contributing to safety and security of the oceans by reinforcing the oceanographic survey and observation system for establishing a Maritime Domain Awareness (MDA) system in collaboration with related ministries and agencies
- Promoting R&D concerning the integration, analysis and forecast of an enormous amount of oceanographic information to achieve Society 5.0 in the oceanographic science fields
- Improving Japan’s R&D capability in marine science and technology, and the international presence of Japan by providing scientific knowledge to the international frameworks such as SDGs

For this purpose, the Agency will specifically put its focus on the R&D themes listed in

(1) to (4) below in this period of mid to long-term objectives. It will also promote challenging and original R&D by taking advantage of flexible ideas and unique perspectives of researchers to help produce new knowledge that supports next-generation marine science and technology, as well as undertaking the development of fundamental technologies to support these R&D projects.

(1) R&D for situational awareness of global environmental and forecast of changes

The world is increasingly concerned about obvious and potentially serious effects of global warming and other environmental changes on economy and society in recent years. Measures for preserving global environment and mitigating climate change have also been considered as important political issues in the 3rd Basic Plan on Ocean Policy, SDGs, Paris Agreement and other treaties. In particular, the importance of investigation, observation and study of the Arctic region, in which the effects of global warming are most obviously, has been increasing worldwide. Human activities affecting global environment have resulted not only in global warming but also in various forms of natural phenomena including ocean acidification and ecological change. Understanding of changes in global environment and the forecast of future global changes are required based on the assessment of interaction between changes in global environment and human activities. Especially, the oceans are considered to take an important role, with its enormous volume, area and heat capacity, in environmental changes in a large scale of time and space, but largely remain unknown.

Accordingly, the Agency intends to enhance its global environment change models and other means to understand more of the unknown part of environmental changes and provide a mid to long-term forecast of future changes. Means to achieve these objectives include the development and enhancement of observation networks by developing new observation technologies for building unmanned, power-saving and highly accurate observation networks, and carrying out highly accurate observation of major marine areas such as Asian sea including coastal region of Japan, Arctic sea, northwest Pacific, tropical Pacific and Indian Ocean by combining various techniques and methodologies. Accumulation and analysis of the data obtained through observations and improvement of global environment change models will help clarify the actual changes of global environment emerging in the ocean with temperature rise, ocean acidification, hypoxic sea water, marine ecological changes, and the processes of such environmental changes. Mid to long-term forecast of changes in global environment with the factor of human behaviors will be found by evaluating new insight for environmental changes, obtained through various efforts, and interaction between the nature and human activities. The results will be distributed to the world through domestic and international activities. This could contribute to making policies in Japan and the world.

(2) R&D for sustainable and effective utilization of marine resources

Marine resources such as a large variety of living creatures, minerals and energy sources are considered to exist in the oceans surrounding Japan, but these marine resources largely remain to be unknown, and only part of them are currently available for effect utilization. Particularly in the scientifically unexplored sea areas such as deep sea and deep sea floor, a plenty of unknown species of living thing are believed to exist and they are different from those in the surface sea areas. Among them are there those which could be useful for human society. The unknown function of the marine ecosystem must be discovered and clarified. For the effective utilization of mineral resources in the water of Japan, the particular sea areas containing potentially useful resources and their amount have to be found. It is therefore important to clarify the mechanism of formation of these resources.

The Agency will analyze various specimens collected in ocean investigation and observation to understand carbon circulation, nitrogen circulation and energy circulation, etc. in the marine ecosystem, and promote interdisciplinary cooperation with nano science and information science to clarify unknown function of the marine ecosystem.

Generation processes of potential resources will be clarified and sea areas containing seabed mineral resources identified by systemizing and generalizing the seabed resource generation model through detailed analysis of specimens and data obtained from investigations and observations up to now.

The outcomes of R&D themes described in (1) are applied as required to carry out these R&D projects, and collaboration with other organizations including universities, public research institutions and private companies is considered to produce more effective results. The samples, data and scientific knowledge obtained will be transferred to the industry in a proactive manner for promoting commercial utilization of marine resources.

(3) R&D on earthquakes and volcanoes in sea areas

Earthquakes including potential Nankai Trough Earthquake and volcanoes such as seabed calderas in sea areas surrounding Japan are active and likely to cause large-scale disasters, suggesting that the state needs to provide stronger disaster prevention and mitigation measures. The situation awareness of earthquakes and volcanoes in sea areas and long-term assessment of potential earthquakes in sea areas are prerequisite to proceed with discussions on specific measures, but in reality, even observation data is not enough. The issue is to enhance scientific knowledge including understanding of earthquake mechanisms through the establishment of observation systems and data collection and analysis.

Accordingly, the Agency will accumulate data and insight for understanding earthquake

mechanisms, present state and future progress of stuck plate conditions, and study on prediction of sea area volcanoes, and distribute information to related organizations including the Headquarters for Earthquake Research Promotion, Japan Meteorological Agency, National Research Institute for Earth Science and Disaster Prevention (NIED), and universities to help understand the present earthquake activities and provide long-term assessment, and assessment of sea area volcanic activities.

To achieve these objectives, the Agency will develop and improve the seafloor geodetic observation to obtain continuous and real-time, wide-area and detailed data centering on the predicted source areas of Nankai Trough Earthquake in collaboration with related organization including the NIED and universities, and carry out high-precision surveys of ocean subsurface structure, and extraction and analysis of seabed sediment and rock samples. Data obtained in these projects will be integrated with existing data and used for analysis to improve the earthquake generation models and methods to predict the progress of stuck plate conditions. In addition, advanced observation techniques will be established for observing volcanoes in sea areas to understand the present activities of volcanoes in sea areas, and analysis of the earth's internal structure and the heat and mass circulation mechanism, etc.

(4) R&D for the enhancing and optimizing marine geophysics information using mathematical method

Now that economic and social activities have been increasingly diversified, causing the destruction ecological system and biodiversity as well as climate change, ocean acidification and the deterioration of other global system functions, comprehensive efforts are required for finding solutions for the issues mutually relating to global environment and social economics to continue the affluent society in the future. Conventionally, measures have been taken according to the knowledge obtained from individual R&D themes in the preceding (1) to (3), but the effects of these measures must be verified from a scientific standpoint to select meaningful measures, because some of these measures bring co-benefit for global environment and social economics, while others are put in the trade-off relationship, in which some have to be abandoned to implement others.

For this reason, the Agency will promote the development and operation of the information infrastructure for efficient implementation of high-level numerical analysis to discover and clarify mutual relationships between complicatedly entangled the ocean, ground and life, while collecting and accumulating information and data on the ocean, ground and life in collaboration with various researchers and engineers in the Agency, and related organization in Japan and abroad, and consolidating, integrating and analyzing this data using a highly sophisticated mathematical method. It will also produce and offer information suitable for the needs of users who are not familiar with expert knowledge

about mathematical and information sciences by providing a highly effective user interface.

(5) Challenging and original R&D and development of advanced fundamental technologies

The ocean is a frontier still left for mankind. It contains areas inaccessible by humans such as ice bound seas, deep sea floors and ocean sub-bottom areas, and a large variety of unknown species of living thing. To explore the frontier or new fields, we must first develop and make use of the intellectual base for science and technology to set out for challenges. With this, it is expected that mankind creates new intellectual property and innovation.

Accordingly, the Agency will challenge formidable scientific research with novelty and originality to develop new academic disciplines or technological fields which may lead the world by founding a flexible and maneuverable research system exceeding the conventional framework of fields and organizations, and promote a bottom-up type technological development by combining ideas of free-minded researchers and new technologies. This can create research and technology seeds for the future and a technology infrastructure unique to Japan.

The Agency will develop a platform for marine investigation and observation, essential for challenging the unexplored frontier, and improve techniques and skills to operate the platform, as well tackling the enhancement of marine investigation and observation technologies including maritime robotics, deep-sea probe technologies, very deep water and deep underground drilling technologies to contribute to promoting national ocean policies by maximizing the outcomes of R&D themes in the preceding (1) to (3), and strengthening the marine investigation and observation system useful for MDA. This may result in the achievement of safe and efficient operation of the platform, and acquisition of highly accurate exploration and survey capabilities suitable for various oceanic and under-the-seabed environments including deep sea floors and ice bound seas.

2. Formation of a core institution for marine science and technology

(1) Promotion of social return of R&D outcomes through closer collaboration with related organizations

To contribute more to solving various social economic and global issues, the Agency needs to strengthen collaboration and partnership with related organizations in Japan and abroad including universities, public research institutes, and private companies, and at the same time, promote strategic utilization of its R&D outcomes and intellectual property. To achieve this, the Agency will strive to acquire the rights of registering its achievements and know-how as intellectual property, build a collaborative system for creating new

values together with related organizations, and create technology seeds for the future by carrying out exploratory R&D. It is important to transfer information based on R&D outcomes in an easy-to-understand way according to the social and economic needs, and maintain and manage R&D outcomes including papers and patents in an appropriate manner.

The Agency will actively cooperate for the international framework as a core institution for marine science and technology in Japan, and strengthen collaboration with major research institutions overseas. To promote scientific drilling projects using Deep-sea Scientific Drilling Vessel CHIKYU under the science plan of the International Ocean Discovery Program (IODP), special efforts are taken for closer collaboration with related organizations, encouraging Japanese to participate in the project and increasing participating nations.

The Agency will promote active participation in national projects such as the Strategic Innovation Creation Program is promoted to vitalize the Agency's R&D activities, further develop R&D outcomes and return the results to the society, and proactively introduce externally-raised capital such as private funds is promoted.

To foster researchers and engineers who are supposed to lead the future of Japan as an oceanic state, the Agency will strengthen collaboration with universities, private companies and public research institutes, etc. for proactively accepting outstanding young researchers and post graduate students in Japan and abroad, as well as extending the science and technology infrastructure through collaboration with high schools to reserve human resources who are potentially active in the future marine science and technology sector.

For improving public understanding on marine science and technology, strategic publicity will be deployed with the characteristics of various layers of society in mind. To expand publicity to the layers difficult for the Agency itself to penetrate, it is important for the Agency to extract a bandwagon effect by collaborating with the companies and organization in any sectors.

(2) Promotion of sharing large research facilities and data, etc.

The Agency will let external organizations in the industry-academia-government use its facilities and systems including marine survey platforms, and computer systems, for the development of marine science and technology.

Under a close partnership with the Atmosphere and Ocean Research Institute of the University of Tokyo and other laboratories, the Agency will formulate a ship operation plan for efficient operation of research ships with special consideration on the features of academic research thereby cooperation with universities and organizations shared by universities for their academic research.

Information concerning marine science and technology such as data and samples obtained from research activities will be categorized and stored properly based on the nature and importance of information, and offered not only to researchers but also general public in an adequate manner according to their needs.

IV Matters concerning improvement and streamlining of administration

1. Establishment of a proper and efficient management system

The Agency will further reinforce its organizational management capability under the leadership of the President to accomplish the role as a core institution for marine science and technology, and improve appropriateness of administration by increasing administrative efficiency and tightening internal control including risk management and compliance. Effective efforts must be taken especially to prevent misconduct in research activity and misuse of research expenditures by observing measures against research misconduct in compliance with the guideline issued by the government. To obtain more achievements in R&D, the Agency will strengthen inter-department collaboration in the Agency, and build an R&D system to enable the whole agency to tackle problems in an integrated manner, as well as reflecting the national policies and latest R&D trends in Japan and abroad in research projects. Also required is the thorough implementation of the PDCA cycles such as the inspection of effectiveness and efficiency in management on a timely basis for further improvement.

2. Rationalization and efficiency of operations

The Agency will promote rationalization and efficiency of operations by reviewing the governing structure, streamlining procurement, computerizing operations, and ensuring efficient operational system.

With regard to the projects to which operating expenses grants are allocated, efficiency will be raised to xx% or more compared with the initial fiscal year in the period of mid to long-term objectives for general administrative expenses (excluding personnel expenditure, mandatory expenses and taxes and public dues), and xx% or more compared with the initial fiscal year in the period of mid to long-term objectives for other expenses (excluding personnel expenditure) with the exclusion of new and expanding projects which are subject to efficiency improvement in the next fiscal year.

As for salary levels, the Agency will carefully consider the salary levels of national public officers, verify what salaries for officers and staff should be, maintain proper levels in light of special characteristics of duties, and release verification results and the state of efforts.

Streamlining of contracts will be promoted by ensuring the efforts according to the “Policy for Streamlining Procurement by Incorporated Administrative Agencies” (decided by the Minister of Internal Affairs and Communications on May 25, 2015), while fairness

and transparency of operation are ensured. These efforts will be inspected or reviewed by the internal audits or Contract Monitoring Committee.

V Matters concerning Improvement in Financial Conditions

the Agency will make efforts to reduce as much expenditure as possible through efficient budget execution, and secure, increase or utilize self-generated income including revenue from entrusted business, patent royalty and facility usage, and externally-raised capital such as competitive research funds.

In light of the revised accounting standards of incorporated administrative agencies, the Agency will continue to manage budgets and results in monetization units in accounting treatment of operating expenses grants.

The Agency will execute budgets in a well-planned manner in consideration of debt service payments of operating expenses grants, dispose of its own property when it is no longer necessary, and in the case of transferring any important property, proceed with a plan.

VI Other Important Matters concerning Administrative Operations

1. Ensuring and enhancing people's reliability

In order to ensure appropriate business operations and people's reliability, the Agency will publicize information appropriately and proactively, and make efforts to protect personal information appropriately as well, subject to the "Act on Access to Information Held by Independent Administrative Agencies" (Act No. 140 of 2001) and the "Act on the Protection of Personal Data Held by Independent Administrative Agencies" (Act No. 59 of 2003).

In light of the Common Standards of Information Security Measures applicable to government agencies, the Agency will take appropriate information security measures to reinforce its defending power and organizational response to cyber attacks with thoroughly training of its staff, as well as grasping the implementation of measures every year to improve information security measures based on the PDCA cycle.

With sufficient consideration for safety when jobs are performed, labor, safety and health management will be implemented thoroughly to prevent accidents and promote safe and smooth operation according to related laws and regulations.

2. Matters concerning personnel affairs

For maximizing R&D outcomes and implementing effective and efficient operations, the Agency will make efforts to secure and foster diversified, highly competent and insightful human resources with leadership ability, and in particular, recruit outstanding researchers in Japan and abroad by actively making use of a cross-appointment system, etc. Its efforts also extend to maintaining and improving the workplace environment and raising productivity with the right persons in the right places and appropriate evaluation and treatment of staff to

raise their motivation in response to diversified work style.

3. Matters concerning facilities and equipment

The Agency will intensively and efficiently update and improve the facilities and equipment required for execution of business operations including measures to mitigate their aging.

Policy System Chart on National R&D Agency, Japan Agency for Marine-Earth Science and Technology

Appendix

Major national policies

[Science and technology policies]

○The 5th Science and Technology Basic Plan (decided by the Cabinet in January 2016)

- Long-term continuous reinforcement of a series of science and technology in relation to response to various issues for supporting the suitable development, utilization and management of "ocean" and "space" as important frontiers for national strategy etc.

[Ocean policies]

○The 3rd Basic Plan on Ocean Policy (decided by the Cabinet in May 2018)

- Improvement of capability to MDA
- Promotion of R&D on marine survey and marine science and technology
- Promotion of Arctic policies etc.

○R&D plan on marine science and technology (decided by the Subdivision on Maritime Science of the Council for Science and Technology, MEXT in January 2017; and revised in January 2019)

- Comprehensive understanding and stronger governance of polar regions and ocean
- Development and utilization of marine resources
- Disaster prevention and mitigation caused by the ocean
- Development of core technologies and creation of future industries
- Promotion of fundamental research for supporting marine science and technology etc.

Act on the Japan Agency for Marine-Earth Science and Technology, Nation R&D Agency

(Objectives of the Agency)
Article 4 (...) aims to enhance marine science and technology standards and make contribution to the development of academic research by conducting fundamental R&D on the oceans and cooperating for academic research on the oceans in a comprehensive manner based on the principles of peace and welfare.

[Agency's approaches in the period of mid to long-term objectives]

The Agency will steadily implement measures indicated in the 3rd Basic Plan on Ocean Policy and so on, and conduct the following R&D themes:

1. R&D for situational awareness of global environment and forecast of changes
2. R&D for sustainable and effective utilization of marine resources
3. R&D on earthquakes and volcanoes in sea areas
4. R&D for enhancing and optimizing marine geophysics information using mathematical method
5. Challenging and original R&D and development of advanced fundamental technologies