Ministry of Defense Response Strategy on Climate Change

August, 2022

Ministry of Defense

This is a provisional translation for reference purposes only.
The original text is in Japanese.

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1. Purpose and Objectives of Formulation

1. Aim


Minister of Defense Nobuo Kishi participating in an online climate security session (April 2021)

Climate change is now recognized as an existential threat to global security. The Minister of Defense participated in the climate security session in the Leaders' Summit on Climate held in the United States in April 2021, where he sat down with defense ministers from around the world to discuss global security challenges posed by climate change and the steps being taken to address them.

The issue of climate change will inevitably have further impact on the Ministry of Defense and the Self-Defense Forces' operations, plans, facilities, and defense equipment, as well as on the security environment surrounding Japan, including our response to future energy shifts, and it has truly become a security issue.

Upon citing the impact of climate change on Japan's security, and also taking a long-term perspective, this document sets forth the following objectives and provides the basic direction for the various measures that the Ministry of Defense and the Self-Defense Forces should strategically address in the future.

2. Objectives

(1) Grasping anticipated future direct and indirect impacts of climate change widely from macro to micro perspectives, the Ministry of Defense and the Self-Defense Forces will adapt and respond appropriately to them, and will fulfill the missions and roles in the future.

(2) In addition, as society as a whole is shifting from fossil fuel-based to renewable energy, hydrogen, ammonia and other energy source-based social structure, in order to achieve carbon neutrality by 2050, the Ministry of Defense and the Self-Defense Forces will strategically and steadily promote new initiatives with an eye to the future and with an awareness of timeline, including issues such as how to respond from a long-term perspective, how to accurately predict the impact of future climate change and energy shifts on the security environment

surrounding Japan, and whether measures need to be implemented now.

(3) Furthermore, in response to the formulation of the "National Government Action Plan (Cabinet Approval on October 22, 2021), the Ministry of Defense and the Self-Defense Forces will, as members of the government, aim to reduce total greenhouse gases emitted by the Ministry of Defense and the Self-Defense Forces (excluding defense equipment) by 50% from the FY2013 level by FY2030.

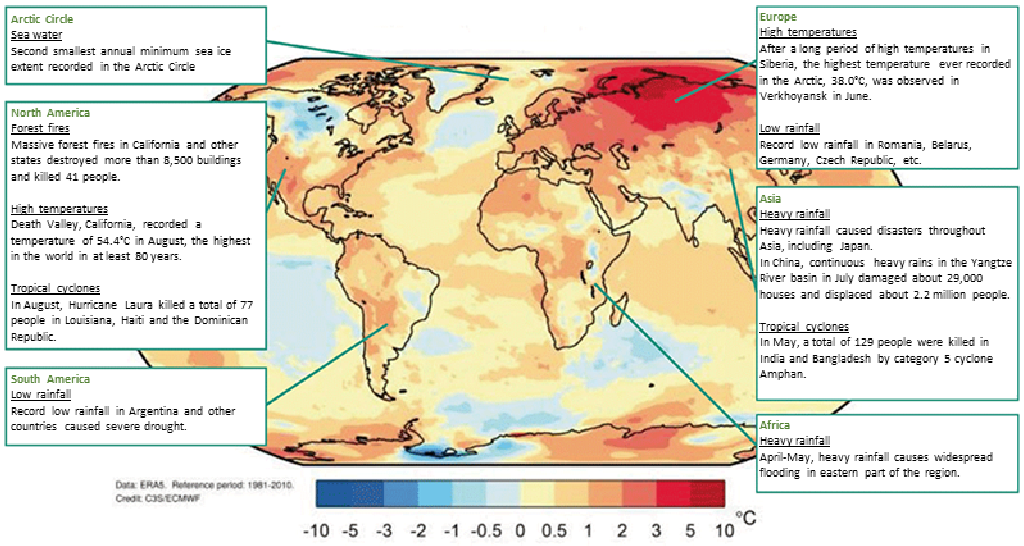
2. Impact of Climate Change on Security

1. Global Trends

The impact of global climate change is not limited to the areas of meteorology and the environment, but extend to a wide range of sectors, including society and the economy. The World Meteorological Organization (WMO) estimates that floods, heat waves, and other disasters caused primarily by climate change have increased five-fold over the past 50 years, resulting in more than 2 million deaths and losses exceeding $3 trillion.

In August 2021, the Intergovernmental Panel on Climate Change (IPCC) released a report that pointed out that there is no doubt that the effects of human activity have caused global warming, that the frequency of climate change extremes is increasing around the world as a result of these effects, and that even if greenhouse gas emissions are kept low, global warming could exceed 1.5°C within the next few decades.

Figure 1-2-1 Extreme weather around the world in 2020



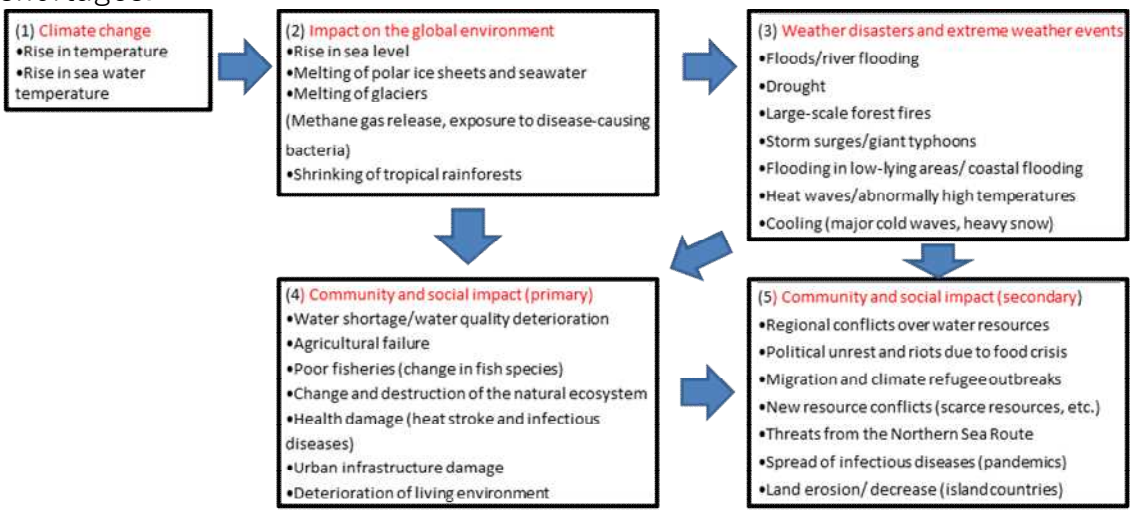
Temperature anomalies for January-October 2020 relative to average temperature for 1981-2020

Material: Created by the Ministry of the Environment from "WMO Provisional State of Global Climate in 2020"

Extreme weather around the world in 2020
[Source: Annual Report on the Environment, the Sound Material-Cycle Society, and Biodiversity in Japan 2021 (Ministry of the Environment)]

Climate change in various parts of the world is likely to cause water and food shortages, deterioration of living conditions, etc., which in turn may exacerbate existing threats to the peace and security of the international community over the long term, due to, for example, large-scale displacement of people, conflicts over limited land and resources, and social and political tensions and conflicts.

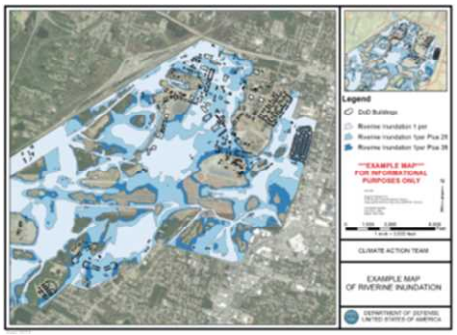
In recent years, the United Nations Security Council, led by Western member states, has taken a proactive stance to treat climate change as a substantive security issue, by pointing out the negative effects of climate change on security in more than ten resolutions focusing on the United Nations stabilization and support missions in Africa, citing such examples as water scarcity, drought, desertification, soil degradation, and food shortages.



Chain reaction of the effects of climate change

Based on recognition that climate change is a security challenge, national defense organizations in various countries have widely grasped the climate change impact on security including the future energy shift issue, and also launched the following initiatives, while incorporating their ideas and policies to address this into their strategies and plans.

・Assessment of vulnerabilities of facilities such as bases and infrastructure to climate change (for example, as the United States Department of Defense continues to assess the vulnerability of its



Defense Climate Assessment Tool (DCAT)
[Source: DOD Climate Assessment Tool]

facilities and activities in the United States and abroad to climate change, it uses the Defense Climate Assessment Tool (DCAT) to evaluate the impact from climate change hazards on its facilities, as well as assess the activities of its the land, sea and air forces.)

- Provisions for climate change response at the strategic, operational and tactical levels
- Buildup of bases and other facilities against climate change effects (sea level rise, extreme weather, etc.)
- Reinforcement of the humanitarian assistance and disaster relief (hereinafter referred to as "HA/DR") posture in response to more frequent and widespread disasters due to climate change
- Strengthening and ensuring resilience of logistics and military supply chain (fuel, power, etc.)
- Organization of lessons learned and successes related to climate change, and training that factors in climate change
- Consideration or implementation of various mitigation measures to reduce dependence on fossil fuels for base facilities and military activities (such as making bases energy independent (solar power generation, small modular reactors (SMR)), use of alternative fuels, development of non-fossil fuel compatible ships, aircraft, vehicles and other defense equipment)

Strategy on climate change, etc.	Examples of initiatives related to equipment and facilities for future decarbonization and energy shift (contributes to reduction of greenhouse gas emissions)				
U.S.	Climate Adaptation Plan Climate Strategy	Alternative fuels (naval vessels and aircraft) Hybridization (ships)	Hybridization (combat vehicles) Electrification (vehicles)	Solar power generation (bases) Electrification (bases)	Technology development (small modular reactors, etc.)
U.K.	Climate Change and Sustainability Strategic Approach	Alternative fuels (aircraft) Zero emissions (aircraft)	Electrification (vehicles)	Solar power generation (bases)	
Australia	Environmental Strategy	Alternative fuels (ships) *Research and development agreements with the U.S. military Research on nuclear energy (submarines, high-performance naval vessels)	Hydrogen powered (amphibious vehicles) Electrification (armored vehicles, reconnaissance motorcycles)	Solar power generation (bases) Microgrid (bases)	
France	Climate and Defence Strategy	Alternative fuels (aircraft) Fuel cells (ships)	Hybridization (combat vehicles)	Solar power generation (bases) Phase out of heavy oil boilers	Technology development (small modular reactors, etc.)

Examples of initiatives of national defense organizations in various countries

2. Impact on the Security of Japan

(1) Future Climate Change Predictions in Japan (Prerequisites)

[Future climate change predictions by the Japan Meteorological Agency and the Ministry of Land, Infrastructure, Transport and Tourism, etc.]

- There will be an increase in the number of extremely hot days and muggy nights in many regions, as well as unusually high temperatures and heat waves will become more prominent.
- The sea level along the coast of Japan has been on the rise since the 1980s. It is predicted to rise up by about 1 m at the maximum by the end of the 21st century.

* It is estimated that if the mean sea level rises by 59 cm, the area and population of the zero-meter zone in the three major bays (Tokyo Bay, Ise Bay, and Osaka Bay) will increase by about 50% (the affected population will increase from the current 4 million to 5.9 million), and if the sea level rises by 1 m, coastal erosion will further progress and about 90% of Japan's sandy beaches will be lost.

- The frequency of severe typhoons around Japan is predicted to increase and the latitude at which they reach their maximum intensity is predicted to move northward. In 2016, three typhoons hit Hokkaido for the first time since statistical records began. It is predicted that typhoons could reach Japan with super typhoon strength with maximum wind speeds of approximately 67 m/s or higher.
- The amount of rainfall* is projected to increase by about 1.1 to 1.5 times in most parts of the country by the end of the 21st century.

* The rainfall change rate is the average of the change rate of rainfall at the target scale (1/100 to 1/200) of the flood control plan for Class A river systems as of the end of the 21st century (future experiment) relative to the end of the 20th century (past experiment).

- The frequency of short-time heavy rainfall of 50 mm or more per hour has increased to approximately 1.4 times in the last 30 to 40 years. In the future, the frequency of heavy rainfall is expected to continue to increase, up to about 1.6 times at the maximum for a 2°C rise, and the frequency of flooding (*) is also expected to almost double.

* Prediction for a Class A river system based on the assumption of future changes in rainfall under the scenario of a 2°C rise in temperature.

The land of Japan is located under extremely harsh conditions in terms of topography, geology, weather, etc. Mountainous and hilly areas make up about 70% of the country's total land area, and compared to the world's major rivers, the rivers are shorter and steeper, making them more prone to

flooding and other disasters due to increased river flow when hit by heavy rains, and also making the population more concentrated in disaster risk areas. As a result, in recent years alone, typhoons and heavy rains have caused extensive damage including floods and landslides in many areas (*), and the advance of climate change is expected to cause even more severe and frequent disasters in the future.


Flooding in large residential areas


Roads cut off by sediment

*In recent years, water-related disasters have become more severe and frequent throughout Japan, such as the Reiwa 1 East Japan Typhoon and the Reiwa 2 Heavy Rain. The total amount of damage incurred was approximately 2.18 trillion yen nationwide in 2019, the largest amount of damage since statistical records began.
There were a record number of approximately 3,500 landslides in 2018, and the Reiwa 2 Heavy Rain in 2020 caused approximately 960 largest-ever wide-area landslides in 37 prefectures.

(2) Impact of Climate Change on the Security Environment

Climate change is expected to have the following direct or indirect impact on facilities such as bases, defense equipment, Self-Defense Force operation, and the health of Self-Defense Force personnel, and various restrictions, obstacles, and hindrances to the Ministry of Defense and Self-Defense Forces are expected to become manifest in performing the missions and roles.

A. Direct impact on bases and other facilities
- Heavy rainfall due to climate change, inundation and coastal erosion of bases and other facilities due to a rise in sea level, and damage to bases and other facilities and infrastructure due to typhoons

B. Impact on the performance and specifications of defense equipment due to changes in the operational environment generated by climate change
- Possibility that climate change may affect the performance and specifications of defense equipment due to extremely high temperatures, changes in seawater salinity, and other factors

C. Impact on Self-Defense Force operation, etc.

・Potential impact on training plans if flooding, inundation, landslides, etc. cause damage to training facilities/areas

・The number of days available for training may be limited due to evacuation, avoidance, or restriction of the training area due to increased frequency of strong typhoons, etc.

・ Potential impact on units with the suspension of logistics due to the blockage of transportation networks and on the transportation system from supply depots to bases throughout the country, etc.

Disaster relief dispatch during Typhoon No. 19 in 2019

D. Increase in anticipated disaster relief dispatches, etc. due to climate change

・ Possible hindrance in maintaining and improving the skills of Self-Defense Forces personnel as the number of training days decreases due to the increased frequency, lengthened duration, wider area, and complex nature of disaster relief dispatches

・Risk of impact on equipment required for disaster relief dispatches

・Increase in international disaster relief activities and HA/DR

Lifesaving personnel dispatched to Atami City, Shizuoka Prefecture for disaster relief in 2021.

Lifesaving personnel dispatched to Miyagi Prefecture during Typhoon No. 19 in 2019.

E. Impact of private and other infrastructure damage due to disasters

・Potential impact on the base of operation such as power and water supply to the Self-Defense Forces activities, bases and others, and logistics, etc. in conjunction with disasters and damage to civilian infrastructure (energy networks, water supply, railroads, airfields, etc.)

F. Increased health risks for Self-Defense Force personnel due to heat waves and extremely high temperatures

・Potential increase in risk of heat stroke, etc. due to heat waves and extremely high temperatures associated with climate change

G. Response to new infectious diseases (or pandemics) due to global warming

・Possible outbreak of new infectious diseases such as animal-borne infectious diseases due to global warming.

(3) Impact around Japan

The following geopolitical risks, for example, are expected to increase around Japan due to the effects of climate change.

[Source: Risk of accelerated global warming due to the disappearance of sea ice in the Arctic Ocean!? Global impact and potential for new routes (Ministry of the Environment website)]

A. Arctic Ocean

In the Arctic Ocean, it is expected that coastal nations and other countries of interest will take action to use shipping routes, have access to seabed resources, and secure offshore interests accompanied by the melting of sea ice.

Along with this, it is concerned that it will have an impact on Japan's security such as instability due to disputes among major powers and related countries over the resources of the Arctic Ocean, China's advancement into the Arctic Ocean via the Sea of Japan, the passage becoming an important shipping route, and so on.

B. Pacific Island countries

Pacific island countries are vulnerable to disasters and are at risk of territorial loss due to rising sea levels caused by climate change. There are concerns that the risks associated with this, including destabilization of countries, friction with neighboring countries, and expansion of China's involvement and influence, will have an impact on Japan's security in the future. In addition, the Self-Defense Forces is expected to play an increasing role in capacity building support, HA/DR, etc. to these countries.

(4) Impact of Future Decarbonization and Energy Shift on the Security of Japan, and the Challenges

A. General trends

Currently, triggered by the response to climate change, major advanced countries, including Japan, are undergoing intense R&D innovation that

is comparable to the Industrial Revolution in around 2050, society as a whole, including Japan, is expected to have energy shifts from fossil fuel-based to renewable energy, hydrogen, ammonia, and other energy sources-based social structure.

In Japan, the public and private sectors are working together to promote the decarbonization of electricity, the development of high-efficiency storage batteries, and the decarbonization of automobiles, ships and aircraft (to non-fossil fuels), among others, based on policies such as the Green Growth Strategy, the Basic Energy Plan, the Plan for Global Warming Countermeasures, and the Long-term Strategy under the Paris Agreement in order to achieve carbon neutrality by 2050.

B. Geopolitical risks of energy shifts

The Japan Maritime Self-Defense Force vessel on a mission to escort an oil tanker in the Gulf of Aden, off the coast of Somalia

With energy shifts, it is important to secure stable supplies of important mineral resources such as rare metals, which are indispensable for renewable energy power generation and storage batteries. The reserves and production of some important mineral resources, such as rare metals, are unevenly distributed in certain countries and regions, and it will be a challenge to secure the supply chain. The Ministry of Defense and the Self-Defense Forces also need to view geopolitical points as security challenges such as the sea lanes issue for stably securing important mineral resources like rare metals and new energy sources, and response to the risk of dependence on the Middle East considering the multiplicity and pluralism of energy sources.

C. Impact and challenges on the security of Japan due to decarbonization and energy shifts

As society as a whole shifts from fossil fuel-based to renewable energy, hydrogen, ammonia and other energy source-based social structure in order to achieve carbon neutrality by 2050, fossil fuels are expected to involve risks such as a significant decrease in distribution volume, high costs, and uneven distribution among suppliers in the future. In conjunction with this, the following specific issues can be considered, which need to be addressed systematically and steadily from now on

with a long-term perspective.

(A) Consideration to reduce dependence on conventional fossil fuels

As evidenced by the recent surge in oil prices triggered by Russia's invasion of Ukraine, energy security is an extremely important issue as it pertains to the foundation of social and economic activities. It is vital for the Ministry of Defense and the Self-Defense Forces to continue to secure stable and sufficient quantities of necessary fuels even with the progression of decarbonization and energy shifts in the future. Looking ahead to 2050, it is necessary to reduce the dependence on fossil fuels in the activities carried out by the Ministry of Defense and the Self-Defense Forces, thereby lowering the vulnerability and risk in energy procurement and enhancing Japan's defense capabilities.

(B) Consideration of new energy source configurations in response to a future decarbonized society (energy shift)

In the society of 2050, it is believed that it will be difficult to continue using fossil fuels for defense equipment at the same level as today, and the Ministry of Defense and the Self-Defense Forces have to consider the energy shift for defense equipment from now with a view to a game change of the way we fight in the future.

3. Basic Approach to Climate Change Response by the Ministry of Defense and the Self-Defense Forces

The security environment surrounding Japan is becoming even more severe, and as described in Section 2, climate change is expected to have a significant impact on Japan's security in the future, and the Ministry of Defense and the Self-Defense Forces also have to soundly adapt and respond to this. Adapting and responding to various challenges associated with climate change will make bases and other facilities, Self-Defense Force operation, and defense equipment more robust, resilient, efficient, and effective, and will also enable the Self-Defense Forces to accurately fulfill the missions and roles in all environments anticipated in the future due to climate change. As adapting and responding to climate change, and maintaining and strengthening defense capabilities are compatible, the Ministry of Defense and the Self-Defense Forces will simultaneously respond to both, as described in the following basic approach.

・Rather than considering the response to climate change negative for our

country's defense, we see it as an opportunity to make our facilities and equipment more robust, resilient, and efficient for the future, and aim to simultaneously address climate change, and to maintain and strengthen our defense capabilities.

- Through improvements in Self-Defense Force operation, training, and maintenance of bases and other facilities necessary to further enhance the effectiveness of deterrence and response, we will ensure that the Self-Defense Forces can accurately fulfill the missions and roles in all environments anticipated in the future due to climate change while developing the effectiveness of the current defense capabilities.
- The Ministry of Defense and the Self-Defense Forces will continue to contribute to the reduction of greenhouse gas emissions toward the government's goal of achieving carbon neutrality by 2050 by making bases and other facilities, Self-Defense Forces operation, and defense equipment more efficient, effective, robust and resilient.

4. Basic Policy on Climate Change Response by the Ministry of Defense and Self-Defense Forces

1. Consideration of Impact by and Resilience to Climate Change when Formulating All Plans, etc.

The Ministry of Defense and the Self-Defense Forces will view climate change as a factor to consider that could have a significant impact on Japan's security in the future, and consider its impact on security and enhanced resilience when formulating strategies, policies, and plans.

2. Promotion of Adaptation and Response to Climate Change Based on Scientific Findings

Each policy on climate change should be implemented appropriately based on scientific findings associated with climate change and climate change impacts. Therefore, it is necessary to make accurate and specific impact predictions and assessments based on scientific findings.

Climate change is a phenomenon with many uncertainties, but in recent years, various forecasting and assessment technologies have been improved by relevant ministries and agencies, research institutes, and armed forces and other bodies of other countries, and in making specific predictions and assessments of each of the impacts listed in this document, we seek to collect a wide range of the latest scientific knowledge,

technological trends, information, and other information, while collaborating and exchanging information with other related organizations. On top of that, specific details of each measure will be discussed and implemented.

3. Provisions on the Need and Direction for Responding to Climate Change in Defense Strategies, Policies and Plans of the Ministry of Defense

The need, direction and other issues of response to climate change will be specified in documents related to strategies and policies, etc., and the respective related plans will appropriately reflect policies for adaptation and response to climate change based on the considerations in the above paragraph 1 and paragraph 2, thereby strengthening efforts to respond to the threats of climate change.

In addition, each of the above plans will be periodically reviewed based on the latest findings on climate change to evaluate the effectiveness of each initiative. In doing so, attention should be paid to further enhance the collaboration of the various plans, in light of the multifaceted impact of climate change on the global security environment and Japan's security environment.

4. Strategic Initiatives Based on Timelines

Facilities such as bases and infrastructure have a long service life and are likely to still be in use in 2050 if they are updated today. Therefore, we will determine the direction of response to the decarbonization and energy shift of facilities and infrastructure of relevant ministries and agencies and the private sector, as well as consider the performance required for facilities such as bases and infrastructure in terms of anti-disaster performance and security due to future climate change, and to systematically work on a roadmap to develop more robust, survivable, efficient and effective bases and other facilities in the era of decarbonization from now.

In addition, since defense equipment takes a very long time to be newly introduced and has a long-life cycle, it is necessary to consider and systematically respond to these issues from now, with an eye toward achieving global decarbonization and energy shift by 2050, as well as the status of energy sources and fuel procurement, technology outlook, future way to fight and other items.

In this document, as for measures that need to be systematically addressed in the future with regard to bases and other facilities, infrastructure, and defense equipment, the direction we should aim at is indicated with a long-term view to the year 2050, and specific measures will be strategically and systematically promoted after formulating a roadmap for each measure (or the equivalent if it is difficult to formulate a roadmap).

Regarding the response to the decarbonization and energy shift of defense equipment, since it is difficult to accurately predict the success or failure of various technological developments and innovations looking toward 2050 at this point in time, we will continue to move forward while revising our plans for measures, technological development, etc. based on the latest information at all times.

In formulating the above roadmap for bases and other facilities, infrastructure, and defense equipment, technologies that are technically feasible (solar power generation systems, micro-grids, SAF, UAVs, etc.) should be prioritized to achieve R&D and demonstration, earlier acquisition and maintenance, and going forward, the R&D of new technologies that are useful but not yet technically established will be closely monitored from a long-term perspective to determine trends and possibilities for future technologies.

5. Specific Measures the Ministry of Defense and the Self-Defense Forces should promote

The following are specific measures that the Ministry of Defense and the Self-Defense Forces should strategically address in the future in response to the issues raised in the Section 2, such as the impact of climate change on Japan's national security and future decarbonization and energy shift.

1. Reinforcement of Bases and other Facilities, and Infrastructure

We will promote the development of more resilient and energy-efficient bases and other facilities, and infrastructure as follows.

(1) Reinforcement of Bases and Other Facilities, and Infrastructure to Disasters, etc. ((1) Heavy Rain/ Short-time Heavy Rainfall, (2) Typhoons, (3) Rise in Sea Level)

A. Carry out projections of specific and chronological impact (various reviews and simulations) on facilities such as bases and infrastructure

in the progression of climate change, and assess the disaster damage risk and vulnerability of such facilities and infrastructure

B. Verify each plan related to disaster preparedness for future climate change impacts and consider the need for revision

C. Formulate a roadmap for strengthening each facility, prioritize them, and systematically promote strengthening of the facilities and measures to address the vulnerabilities based on the verification, etc. of (A) and (B) above

D. Build relationships and collaborate with related ministries and agencies, research institutes, local governments, etc. in order to obtain the best information (forecast data and simulation results, hazard maps, etc.) necessary for forecasting in a timely manner

(2) Energy Independence of Bases and Other Facilities (Conversion to Green Base)

Image of a solar power generation system
[Source: Agency for Natural Resources and Energy website]

Facilities such as Self-Defense Forces bases serve as bases in the event of a disaster, etc., and power supply interruption must not be allowed.

In addition, many Self-Defense Forces bases and other facilities are located on remote islands and in isolated areas, and they are in harsh environments where electric power supply is fragile or not connected to the grid, and where supplies are not easily available in case of typhoons or emergencies, and consequently, measures to ensure stable and uninterrupted access to necessary electric power are particularly important. As climate change is expected to cause more severe and frequent disasters in the future, it is necessary to develop renewable energy facilities such as photovoltaic power generation systems and energy storage facilities, which will contribute to reducing greenhouse gas emissions from bases and other facilities, while also having a discussion toward energy independence (conversion to green base) with resilience even in the event of a disaster or emergency.

A. Promote a collaborative project with the Ministry of the Environment called the "Demonstration Project for Making Renewable Energy Mainstream and Strengthening Resilience on Remote Islands"

B. Conduct studies toward energy independence (conversion to green base) by installing renewable energy facilities at bases and other facilities, select model bases, and implement demonstration projects. In doing so, we will verify the effectiveness, assess cyber security and disaster risks and vulnerabilities, and discuss necessary countermeasures

C. Develop and systematically work on a roadmap to roll it out to bases and other facilities nationwide, after setting a target year for the maintenance based on the results of the demonstration projects, etc. described in (B) above

(3) Ensuring a Stable Supply of Electricity to Bases and Other Facilities

Looking ahead to 2050, it is expected that the electrification of defense equipment at Self-Defense Forces bases and other facilities will further advance, and that the demand for electricity will increase. In addition, electricity derived from renewable energy sources has certain risks such as unseasonable weather or disaster damage due to future climate change, and even when procuring electricity from the outside, Japan imports most of its energy sources from overseas, and soaring fuel costs associated with geopolitical risks may cause electricity prices to soar.

In order to sustainably and stably ensure the amount of electricity required for bases and other facilities into the future, the following studies should be conducted from now.

A. Comprehensively consider what the future energy mix of the Ministry of Defense and Self-Defense Forces should be, taking into account various risks and costs, domestic trends based on the Basic Energy Plan, technological progress and feasibility, and trends in the armed forces of other countries with a timeline in mind

B. Closely monitor future energy security issues in Japan from the perspective of the Ministry of Defense and the Self-Defense Forces

2. Improvement on Defense Capabilities and Enhancement on Resilience of Defense Equipment

(1) Enhancing the Capability and Resilience of Defense Equipment for Future Operation Environments

A. Review the impact of climate change on the operational environment of

defense equipment (effects of extremely high temperatures, rising sea water temperatures, and changes in sea water salinity, etc.) under various scenarios, and carry out necessary countermeasures.

B. Consider including climate change-resilient functions (ability to withstand extreme heat, etc.) in specifications for purchasing defense equipment

C. Examine whether the content of research and development of defense equipment in the Ministry of Defense and the Self-Defense Forces is (or should be) based on responses to climate change impacts

(2) Responding to New Energy Source Configurations for a Future Decarbonized Society (Energy Shift)

Verification of electric towing vehicle for aircraft
Matsushima Base, Japan Air Self-Defense Force

Looking ahead to the year 2050, it is necessary to examine the direction of response along the timeline regarding future energy sources/fuels (*) and means of supply for each defense equipment in order to respond to new energy source configurations in the future. Therefore, as for defense equipment and other items currently in use or to be introduced in the future, we will formulate a roadmap showing the direction of response along a time line as well as the way forward for energy sources, means of supply and other factors by each representative defense equipment, and specify the mid- to long-term countermeasures.

The roadmap will be studied based on the technologies that can be expected at the present time and will be revised as necessary based on the progress of various technological developments and innovations in the future.

*Conventional fossil fuels, SAF, biofuels, synthetic fuels, hybrids, electrification, hydrogen and ammonia fuel engines, fuel cells, etc.

(3) Cutting-Edge Technology-related Initiatives that Can be Game Changers for the Era of Decarbonization

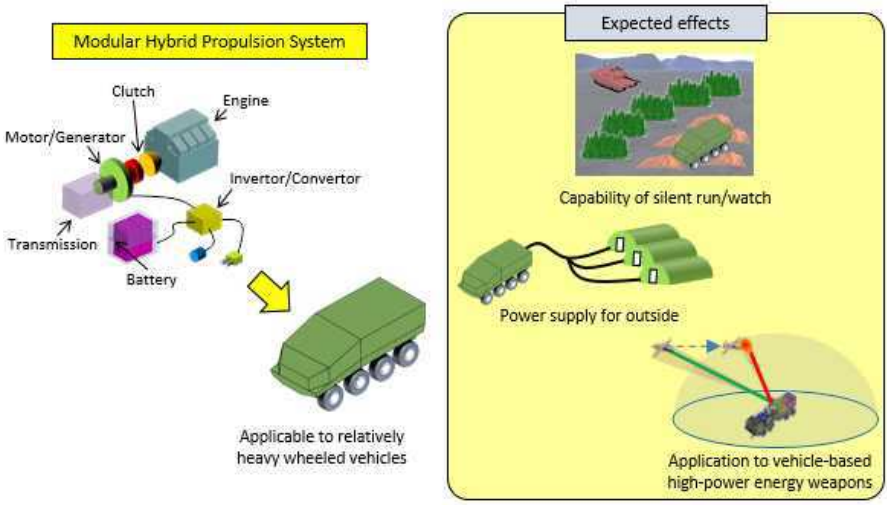
We will consider innovative defense equipment (*) that corresponds to a decarbonized society, further strengthens resilience, and enhances deterrence and response capabilities with an eye on how to carry out

warfare, energy source configurations and status of fuel procurement, etc., in 2050.

*For example, we will consider promoting various measures related to game changers in the way of warfare ((1) introduction of AI into various systems, (2) introduction of drones and UAVs, (3) introduction of UAVs and UUVs, (4) introduction of laser weapons, (5) introduction of robots, (6) introduction of electric or hybrid reconnaissance vehicles, (7) introduction of locally portable solar power generation and storage facilities, among others), which are currently being addressed from the perspective of security requirements, by adding the perspective of responding to future energy shifts.

(4) Promotion of Research on Hybrid Systems for Combat Vehicles

We are promoting research on hybrid systems for future combat vehicles under joint research between Japan and the U.S.



Research on Modular High Power Density Hybrid Propulsion Technology

3. Strengthening of Sustainability and Resilience in the Logistics Sectors

(1) Consideration to Reduce Dependence on Conventional Fossil Fuels

As for fuels, to be actively involved in the introduction of alternative fuels (SAF, biofuels, synthetic fuels, etc.) as the entire nation including the Ministry of Defense and the Self-Defense Forces is necessary in order to replace fossil fuels, to overcome the vulnerabilities in defense fuel supply, and to enhance resilience from the perspective of future supply chain risks and in the sense of securing energy resources so that we can research, develop, manufacture and procure them in Japan

as described below.

A. Consider introducing alternative fuels (SAF, biofuels, synthetic fuels, etc.) to replace fossil fuels

B. Align with the public-private development of domestic alternative fuels worked on by the relevant ministries and agencies as to those that Japan can research, develop, manufacture, and procure in Japan

(2) Strengthening of the Logistics of the Ministry of Defense and the Self-Defense Forces

We will strengthen the logistics of the Ministry of Defense and the Self-Defense Forces as follows to accurately fulfill the missions in any environment expected due to climate change.

A. Conduct verification and review of transportation means and systems to ensure the functioning of transportation and logistics in the event of transportation network interruption due to a disaster

B. Share information on airports, ports, roads, public facilities and other places owned by relevant ministries and agencies, and local governments that are expected to be used by the Ministry of Defense and the Self-Defense Forces while understanding their risk of damage and vulnerability

C. Examine the transportation system from supply depots to bases and other facilities nationwide as well as the concept of stockpile at supply depots, and implement necessary countermeasures based on the scenarios and assumptions of the expected impact on units due to the suspension of logistics caused by the blockage of transportation networks

D. Consider the possibility of using drones as a new means of transportation

4. Reinforcement of Disaster Response Capabilities

As climate change is expected to further cause more severe and frequent disasters and new infectious diseases in the future, the Ministry of Defense and the Self-Defense Forces will strengthen the disaster response capabilities as follows.

(1) Disaster Relief Dispatches

A. Conduct periodic surveys on key trends and risks, among others, of disaster relief

Training scene (image)

dispatches expected due to climate change based on the latest findings

B. Build a database to collect and share information on model cases and lessons learned from past disaster relief dispatches, reflect this information on plans, etc., and conduct table top exercises, etc.

C. Collect climate and environmental data held by relevant ministries and agencies, research institutes, and local governments, among others, in advance, and assess and understand the climate vulnerability risks of disaster relief dispatches by the Ministry of Defense and Self-Defense Forces (to enhance predictability and use for scenario, planning and other purposes in advance)

D. Work with relevant ministries and agencies, and local governments, strengthen cooperative relationships in areas where disaster relief dispatches may be deployed, and consider community-based countermeasures to further improve the effectiveness of disaster relief

[Examples of issues to consider]

・Prepare for future climate change disasters by obtaining forecast information, developing plans, conducting drills, and sharing roles and responsibilities in cooperation with local communities

・Clarify roles and strengthen cooperation among relevant ministries and agencies, local governments, and other stakeholders

・Reduce the burden on the Self-Defense Forces and increase the effectiveness and efficiency of the activities by further utilizing Self-Defense Forces reserve personnel, and by utilizing private companies and volunteers by the Ministry of Defense and the Self-Defense Forces

・Further utilize retired Self-Defense Force personnel in disaster preparedness-related departments of local governments (further enhancement of reemployment support)

・ Conduct training and table top exercise programs with multiple stakeholders in attendance for a variety of climate-related scenarios

Use of material carrier in disaster relief dispatches

E. Work on maintaining the equipment necessary for disaster relief dispatches

(2) Response to New Infectious Diseases (or Pandemics) Associated

with Global Warming

A. Organize lessons learned from the disaster relief activities of the Ministry of Defense and the Self-Defense Forces during infectious disease outbreaks, and share and accumulate them with relevant divisions within the Ministry
B. Promote the information exchange and relationship building with relevant ministries and agencies, research institutes, and armed forces of other countries, among others, and clarify the division of roles from peacetime
C. Periodically review the response to infectious diseases based on changes in the situation, the results of assessments made from time to time on the response capabilities of the Ministry of Defense and the Self-Defense Forces in relation to countermeasures, and other factors

5. Reinforcement of Strategic Security Cooperation

(1) Strategic Promotion of Multifaceted and Multi-layered Security Cooperation

A. Strategically promote multifaceted and multi-layered exchanges and cooperation on the theme of climate change (exchanges with other countries, multilateral exchanges, international conferences, joint training on HA/DR, joint research and development, etc.)

Signing of the Multilateral Agreement on Climate Change hosted by the Royal Air Force. General Izutsu, Chief of Staff, Japan Air Self-Defense Force (4th from right) July 2022 [Source: Official Twitter account of the Royal Air Force].

B. Further deepen partnerships and cooperation with domestic and international organizations, and make international contributions (capacity building support, international disaster relief activities, cooperation related to HA/DR, collaboration with ODA, etc.)


International disaster relief operations in Australia (January-February 2020)

C. Promote the exchange of information and views between the Ministry of Defense/Self-Defense Forces and the armed forces of other countries on the direction of energy sources/fuels and defense equipment that contribute to decarbonization and energy shift in the armed forces in the future; and

be actively involved from the perspective of international rulemaking, backed by Japan's superior technological capabilities

(2) Foster a Common Awareness and Understanding of the Impacts of Climate Change on the Future Security Environment, and the Responses to These Impacts

The following geopolitical risks are expected to increase due to the effects of climate change, and these issues need to be addressed appropriately.

[Change in strategic positioning of the Arctic Ocean]

A. The sea ice area in the Arctic Ocean has been decreasing, and the period and sea area available for navigation of vessels have been expanding, and in the future, it may be used for deployment of maritime forces and military maneuvering deployment using military sea transport capabilities.
B. The route from Japan to Europe via the Arctic Ocean can reduce the distance to about 60% compared to the route via the Suez Canal, and this area may become even more important for Japan in the future.
C. The Arctic Circle is said to contain abundant reserves of undiscovered natural resources, and various countries are also becoming increasingly active in the area in their quest for resources.

[Destabilization due to climate change]

A. Pacific Island countries are in danger of territorial loss due to rising sea levels, and increased extreme weather events are expected to increase large-scale disasters and spread infectious diseases around Japan.
B. Regarding the melting of snow and ice, attention should be paid to the effects of ice and snow on the Tibetan Plateau, which is the source of many large rivers, including the Mekong River.

In order to respond to these situations, we will also cooperate with relevant ministries and agencies, and countries, etc., to take serious interest in the impact of climate change on Japan's security environment as a security issue, conduct wide-ranging information gathering and assessment, and make efforts to share a common understanding and awareness of the threats, challenges, and countermeasures of climate change in collaboration with relevant ministries and agencies, relevant countries and other authorities on an issue-by-issue basis.

(3) International Disaster Relief Efforts and HA/DR Initiatives

A. Collect climate and environmental data in advance regarding areas where international disaster relief operations or HA/DR may take place, and assess and understand the climate vulnerability risks of the activities of the Ministry of Defense and the Self-Defense Forces
Particular attention should be paid to the possibility of increased HA/DR to neighboring Asian and Pacific Island countries in the future.

B. Use (A) above to enhance the predictability of future activities and to develop scenarios, plans and other purposes in advance; and carry out table top exercises and simulations based on such scenarios, plans, etc.

C. Continue to implement and enhance seminars and capacity building support by making effective use of lessons learned and know-how accumulated so far by the Ministry of Defense and the Self-Defense Forces through domestic and international disaster relief operations, HA/DR, and other activities while maintaining close communication with ASEAN countries and Pacific Island countries

Capacity building support for the Philippine Army in November 2021

D. Consider collaborating with reserve Self-Defense Force personnel, volunteers, and outside contractors in HA/DR

(4) Response to Geopolitical Risks Associated with Future Energy Shifts (Critical Mineral Resources Such as Rare Metals and New Energy Sources)

A. We will make efforts to cooperate with relevant ministries and agencies, and other countries concerned to have a common understanding and awareness of new security issues such as addressing geopolitical risks and securing sea lanes in regions different from those in the past in order to stably secure important mineral resources such as rare metals and new energy sources associated with the energy shift, etc.

B. If the Ministry of Defense and the Self-Defense Forces continue to use fossil fuels from the perspective of securing multiplexed and multipolarized energy sources in the future, we will consider how to respond to geopolitical risks such as Japan's continued dependence on

the Middle East among developed countries in the future.

6. Improvement of Living and Working Environments of Self-Defense Forces Personnel and Reinforcement of Sanitary Functions

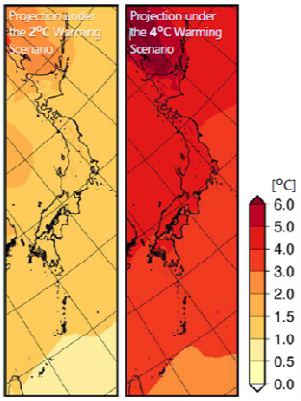
(1) Response to Increased Health Risks for Self-Defense Forces Personnel Due to Heat Waves and Extremely High Temperatures

A. Promote the installation of air-conditioning equipment as needed in areas where air-conditioning equipment was not previously required such as military barracks, government buildings, maintenance factories, etc.

B. Promote examining clothing and equipment taking into account the increased health risks for Self-Defense Force personnel who are expected to operate in heat waves and under extremely high temperatures, as well as the need for air conditioning equipment for defense equipment

C. Consider and implement further appropriate measures to prevent and deal with heat stroke among Self-Defense Forces personnel

D. Promote greening of the grounds and rooftops of buildings on bases and other facilities as a heat island countermeasure, and consider measures such as the introduction of permeable and water-retentive pavement on roads and sidewalks on bases and other facilities, and the installation of rainwater harvesting and infiltration facilities



Changes in annual surface temperature for the end of the 21st century (2076 – 2095 average) relative to the end of the 20th century (1980 – 1999 average)

[Source: Ministry of Education, Culture, Sports, Science and Technology and Japan Meteorological Agency, "Climate Change in Japan Report on Assessment of Observed/Projected Climate Change Relating to the Atmosphere, Land and Ocean – December 2020 (Abridged Edition)"]

(2) Response to Water- and Food-Borne Diseases, and Animal-Borne Diseases

A. Work to secure medicines and other resources for diseases.

B. Work to address vector control (mosquitoes, rodents, ticks, etc.) at bases and other facilities.

7. Improvement of Efficiency and Reduction of Greenhouse Gas Emissions at Bases and Other Facilities

(1) Energy conservation at bases and other facilities, and infrastructure

A. In principle, new construction projects planned for the future will be

equivalent to ZEB Oriented or higher, with the aim of achieving a level equivalent to ZEB Ready or higher on average for new buildings by FY2030.

*ZEB (ZEB (Net Zero Energy Building): Buildings that have achieved energy savings of 50% or more and have further reduced energy consumption through the introduction of renewable energy sources are defined as (1) ZEB (100% or more reduction), (2) Nearly ZEB (75% to less than 100% reduction), or (3) ZEB Ready (no introduction of renewable energy), depending on the amount of reduction, and buildings of 10,000 m^2 or more that save 30-40% or more energy and that introduce technologies that are expected to save energy but not currently evaluated in energy conservation calculation programs based on the Building Energy Efficiency Act are defined as (4) ZEB Oriented.

B. The Ministry will systematically work to increase the percentage of LED lighting installed in the Ministry of Defense and the Self-Defense Forces, including existing facilities, to 100% by FY2030, while managing its progress.

C. We will promote retrofitting of equipment and appliances with low energy efficiency to high-efficiency equipment, and replacement with advanced equipment.

(2) Improve efficiency and reduce greenhouse gas emissions from Ministry of Defense and Self-Defense Forces facilities, etc. (mitigation measures)

A. Procurement of renewable energy power

・Systematically work to ensure that 60% or more of the electricity procured by the Ministry of Defense and the Self-Defense Forces will be generated by renewable energy sources by 2030, while managing its progress

B. Installation of renewable energy facilities such as solar power generation facilities

・ Aim to install photovoltaic power generation equipment in approximately 50% or more of the Ministry of Defense and the Self-Defense Forces buildings (including sites) that can be built by FY 2030 (while considering the installation of a micro-grid system of photovoltaic and other power generation, and storage facilities on the sideline)

・Promote and reinforce the use of renewable energy at the Ministry of Defense and Self-Defense Forces bases and other facilities

・Consider the installation of energy storage facilities to deal with the instability of renewable energy on the sideline

C. Consideration of phasing out boiler facilities, etc.

It is necessary to promote electrification with renewable energy sources for facilities that use fuel, such as boiler facilities, which are a major source of greenhouse gas emissions from bases and other facilities in order to avoid immobilization of the infrastructure with greenhouse gas-emitting structures for a long term. It is also necessary to discuss specific policies for facilities that are difficult to be electrified, such as considering the conversion of fuels we use to carbon-neutral fuels, in order to systematically make efforts in light of future energy shifts.

Therefore, the response policy and the step-by-step use of alternative fuels for generators, including the phasing out of boiler facilities, will be considered.

In addition, the above considerations shall also include examination of measures to be taken in the event of an increase in the unit price of electricity due to increased dependence on electricity, as well as backup functions such as temporary heat sources.

D. Procurement of electric vehicles

Except in cases where no alternative electric vehicles (*) are available, all new vehicles to be introduced or renewed will be electric vehicles (excluding defense equipment) from FY2022 onward, and the Ministry will systematically work to ensure that all official vehicles in use will be electric vehicles by FY2030 while managing the progress.

*Electric vehicles: electric vehicles, plug-in hybrid vehicles, hybrid vehicles, fuel cell vehicles

E. Reduction of greenhouse gas emissions from construction work, etc.

・Strive to reduce greenhouse gas emissions in the execution of construction work, for example, making efforts to use heavy equipment with low greenhouse gas emissions, to improve construction efficiency through the use of ICT, to use materials with environmentally friendly specifications, and to actively use lumber

・Consider the required construction period, especially for large-scale facility development plans, such as an increase in the number of days when work cannot be performed on site due to an increase in extreme events including heavy rain and typhoons, and a decrease in work

efficiency at the site due to extreme heat in order not to affect the timing to start operation of the Self-Defense Forces

8. Training, Education and Human Resource Development

(1) Adaptation of Unit Operation and Training to the Future Security Environment Associated with Climate Change


High-performance simulator for training (image)

In recent years, various simulators have evolved due to improvements in computing power of computers, AI, graphics technology, etc. These could be further utilized to respond to cases where on-site training is not possible due to climate change, or to simulate and train for future expected extreme weather and disaster situations. Therefore, we will promote training through the introduction and use of various simulators.

(2) Education and Human Resource Development

A. Incorporate various types of education into the curriculum and educate all personnel and staff on climate change in general in order to increase awareness and understanding of the Ministry of Defense and the Self-Defense Forces regarding climate change

B. Enhance internal systems, including training and education of personnel to take the lead on climate change issues in the Ministry of Defense and the Self-Defense Forces

9. Reinforcement of Technology Base

(1) Utilization of Research and Innovation

A. Expand investment in climate change-related research and innovation prioritized by the Ministry of Defense and the Self-Defense Forces; in doing so, consider cooperation and role-sharing with related ministries and agencies, universities, research and development corporations, private companies, ally and partner countries, and others; and pursue government-wide promotion of technological development beyond the boundaries of ministries and agencies

B. Implement or develop tools that provide the means to understand and

respond to the impact of climate change on the activities of the Ministry of Defense and the Self-Defense Forces (assess the impact of climate change on bases and other facilities, respond to increasingly large-scale disaster mobilization, analyze energy usage in unit and equipment operation, etc.).

(2) Effective Promotion through Public-Private Partnerships

With the collaboration of industry, government, and academia, Japan has conducted a variety of research and technology development, including structural transformation of the energy and industrial sectors, and creation of innovation through bold investment, in order to achieve carbon neutrality by 2050 through national efforts. The Ministry of Defense and the Self-Defense Forces will pursue this initiative not by itself but in alignment with those developments and in cooperation with universities, research and development corporations, and private companies, etc. by promoting it as a whole government initiative and actively utilizing advanced technologies that enable dual use.

(3) Reinforcement of Defense Industrial Bases

Japan's advanced technological capabilities form the foundation of its economic and defense power and are of great significance in terms of national security. In introducing new defense equipment, such as advanced equipment, for future decarbonization and energy shift in the Ministry of Defense and the Self-Defense Forces, we will make efforts to procure it in Japan, while also taking into account the possibility that strengthening the defense industrial base will also contribute to addressing climate change.

10. Collaboration with Local Communities

(1) Achieving Harmony with and Contributing to Local Communities

The number of zero-carbon cities that have pledged to achieve zero CO2 emissions by 2050 is increasing nationwide (42 prefectures, 440 cities, 20 special wards, 209 towns, and 38 villages as of the end of June 2022), and carbon neutral lifestyles and urban development are being promoted in the areas that have pledged through multiple efforts linked to energy conservation and renewable energy use in the area.

The Ministry of Defense and the Self-Defense Forces have bases and

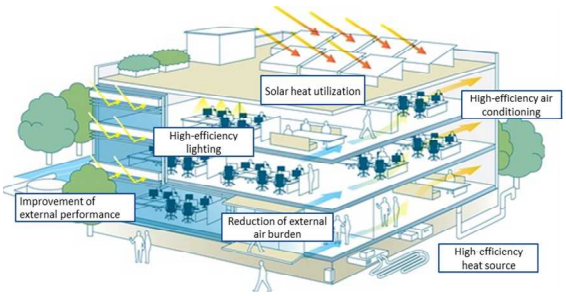
other facilities located throughout Japan, and as a member of the local community, we will consider maintaining harmony with the local community and contributing to the urban development toward climate change countermeasures and carbon neutrality of local public entities around bases through efforts to reduce our own greenhouse gas emissions and measures to aim for harmony with areas around our defense facilities.

A. Contribute as a member of the local community through the reduction of greenhouse gas emissions of the Ministry of Defense and Self-Defense Forces

B. Consider supporting various measures of community development for climate change countermeasures and carbon neutrality that local governments in the vicinity of defense facilities are working on in order to harmonize with the local community around the defense facilities

[Examples of measures taken by other ministries and agencies]

Conversion of facilities to ZEB (ZEH) in subsidized projects, installation of renewable energy facilities, and subsidies for energy efficiency and conservation audits for subsidized projects in previous years, among others, as cooperation for the Zero Carbon City Plan by local governments



[Source: Energy Conservation Portal Site ZEB (Net Zero Energy Building) (Agency for Natural Resources and Energy website)]

(2) Consideration of Permission to Use Ministry of Defense and Self-Defense Forces Land for Construction of Renewable Energy Facilities

If there is a request from a local government, etc. to use the land for the construction of a renewable energy facility, the Ministry of Defense and the Self-Defense Forces will consider granting permission to use the land, provided that it does not interfere with the use or purpose of administrative property and with our missions.

6. Notes

1. Based on the latest findings on climate change, the effectiveness and other aspects of efforts shall be evaluated, and plans and activities shall

be reviewed on a regular basis based on these evaluations.

2. Regarding the framework of the Climate Change Task Force that will be set up in the establishment of the Climate Change Task Force by the Ministry of Defense (Notification) (Ministry of Defense Document No. 124. May 13, 2021), a follow-up will be conducted annually on the status of implementation of the various measures included in this document.

Oniki Ex-State Minister of Defense, at the Climate Change Task Force (April 2022)

Discussions at the Climate Change Task Force

3. This document shall be reviewed as necessary based on the results of follow-up after the formulation and the difficulty of forecasting climate change projections that will change depending on the status of future global efforts to achieve carbon neutrality, changes in the security environment surrounding Japan, and the remarkably rapid progress in innovation, science and technology related to decarbonization and energy shift, among others.

End of document