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藍色經濟、海洋觀光及永續藍色金融國際研討會
及政策對話精要

Regional Conference and Policy Dialogue on Blue Economy,
Ocean Tourism, and Sustainable Blue Financing

世界氣象組織2019年全球氣候狀況聲明

WMO Statement on the State of the Global Climate in 2019



海洋委員會
Ocean Affairs Council

發行



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Achieving Ocean Sustainability Together with Japan

Translated by Linguitronics

Minister of the Ocean Affairs Council: Chung-Wei Lee

As members of Asian ocean countries, both Taiwan and Japan have their own respective strengths in ocean governance, industrial development, and research. In this issue, we highlight Japan's ocean policies, research, and industry. "Organization Focus" introduces the Japanese Headquarters for Ocean Policy and related competent institutions which formulate ocean policies. On the regulatory side, we introduce the latest issue of "Basic Plan on Ocean Policy," in which we see how Japan faces the "new challenges of establishing an ocean nation."

As the world is paying attention to the issue of marine debris, Taiwan and Japan can reference each other's policies in terms of marine waste governance. In this issue, we compare the two countries' marine waste action plans. Japan's action plans emphasize the importance of scientific research, as well as strengthening marine waste governance through international support. While in Taiwan's "Tribute to the Sea" policy, various agencies assess and integrate the capabilities of marine debris cleanup, serving as a first step in laying the foundation for ocean governance. Another highlight is Japan's marine research and blue economy, in which the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) sets its position in core equipment such as earth simulators, offshore drilling vessels, submersibles, research vessels, and related research. And another focus of this issue is the "Regional Conference and Policy Dialogue on Blue Economy, Ocean Tourism, and Sustainable Blue Financing," through which we discuss how countries develop effective blue finance mechanisms to conserve ocean resources and revive ocean economies.

In Part I of our "Special Report," we introduce the latest Statement on the State of the Global Climate in 2019 from the World Meteorological Organization (WMO), which discusses climate indicators such as increases in concentrations of greenhouse gases, rise in sea levels, ocean acidification, and high-impact events like heatwaves and wildfires. In Part 2, we analyze the ecological catastrophe faced by the Formosa Bank, where sea sand stealing has damaged the marine habitat and is causing the gradual collapse of the ocean ecosystem. Changes in the climate and ocean ecosystem are nature's warning signs, and they appeal to the people to face the issues of climate change and the affected ecosystem. That is why we have even more reason to strive together and take action to maintain a sustainable ocean!

Abandoned garbage that flows into the ocean not only affects marine life, but also damages the marine ecosystem

Image by David Slater / NOAA (CC0)

<https://www.flickr.com/photos/onms/28250723916/>



WMO Statement on the State of the Global Climate in 2019

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Keywords: World Meteorological Organization, climate change, high-impact events

The World Meteorological Organization (WMO) released the statement on the state of global climate in 2019. This statement presents the knowledge of latest climate science, the high-impact events driven by climate change and their associated risks. In 2019, the temperature reached the second high, the levels of greenhouse gases increased, the sea level rose, the ocean acidity increased and the sea ice extent decreased. Accelerating climate change and extreme weather events threaten human health, food security, livelihoods, economies and marine ecosystems, leading to deaths and injuries, starvation, population displacement and disruption of marine ecosystems. The globe is currently way off track to meeting either the 1.5°C or 2°C targets that the Paris Agreement calls for. In light of this, everyone – from government, civil society and business leaders to individual citizens – need to heed climate change facts and take urgent actions to halt the worst effects of climate change.

Global climate indicators

I. Temperature

The global mean temperature for 2019 was $1.1 \pm 0.1^\circ\text{C}$ above pre-industrial levels. It is noted that the 1850-1900 baseline was used as an approximation of pre-industrial levels. The year 2019 is the second warmest in instrumental records, second only to the record set in 2016. Without the role of El Niño in the warming increase observed in 2016, 2019 would have been a record year. The past five years, 2015-2019, are the warmest on record, and the past decade, 2010-2019, is also the warmest on record. Since the 1980s, each successive decade has been warmer than any preceding one (Figure. 1).

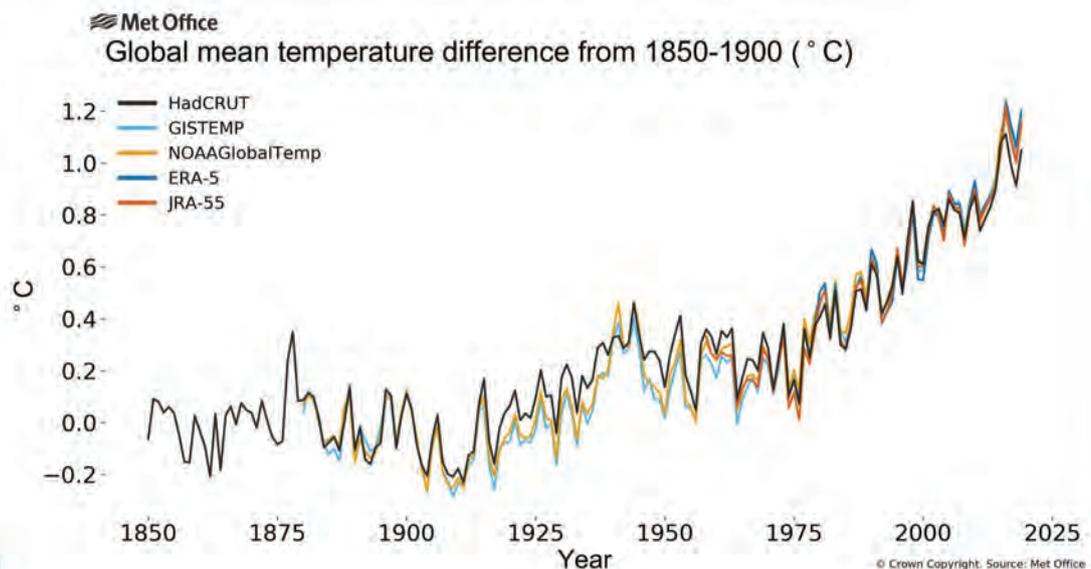


Figure 1/ The global mean temperature is increasing compared to the pre-industrial levels
Source / Met Office

<https://public.wmo.int/en/media/press-release/wmo-confirms-past-4-years-were-warmest-record>

II. Greenhouse gases

Greenhouse gases reached record levels in 2018 with carbon dioxide (CO₂) at 407.8±0.1 parts per million (ppm), methane (CH₄) at 1869±2 parts per billion (ppb) and nitrous oxide (N₂O) at 331.1±0.1 ppb. These values constitute, respectively, 147%, 259% and 123% of pre-industrial levels. While global average figures for 2019 will not be available until late 2020, real-time data from some specific locations, including Mauna Loa (Hawaii) and Cape Grim (Tasmania) indicate that levels of CO₂, CH₄ and N₂O continued to increase in 2019.

III. Ocean

The ocean absorbs around 90% of the heat that is trapped in the Earth system. Ocean heat content (OHC) refers to the heat absorbed by the ocean. It is one of key indicators of global warming. The higher the OHC, the warmer the earth. In 2019, OHC in the upper 700 m and in the upper 2,000 m continued to rise, reaching record-high levels (Figure. P3). Thermal expansion from ocean warming, combined with melting of ice on land, leads to sea level rising, which affects coastal areas. In 2019, the sea level continued to rise, with the global mean sea level reaching its highest value since the beginning of the record in January 1993. The average rate of rise is estimated at 3.24±0.3 mm yr⁻¹ over the past 27 years period, but the rate has increased over time.

In the decade 2009-2018, the ocean absorbed around 23% of annual CO₂ emission. While this helps to alleviate the impact of climate change, it alters the chemistry of the ocean and thus increases the acidity of the ocean, called as ocean acidification. Observations over the last 20 to 30 years show a clear decrease in average pH, with a decline of the average global surface ocean pH of 0.017-0.027 pH units per decade since the late 1980s.

Both observations and numerical models indicate that oxygen is declining in the ocean. Since the middle of the last century, there has been an estimated 1%-2% decrease in the global ocean oxygen inventory. Low levels of oxygen in the ocean will alter the diversity, composition, abundance and distribution of marine life. Even studies showed that coral reefs are recognized vulnerable to major oxygen loss.

IV. Cryosphere

Cryosphere refers to the places where water is in its solid form, frozen into ice or snow. The cryosphere mostly exists in the areas around the North Pole the Arctic and the South Pole the Antarctic. But it can also be found in other locations on Earth such as high mountain areas. The cryosphere is one of key indicators of climate change. The sea ice extent shows seasonal variations with the size bigger during wintertime and smaller during summertime.

Since 1979 when the sea ice extent data is available by the satellite survey, Arctic sea ice has seen a long-term decline in all months, with the largest relative losses in late summer. On 13 March 2019, the Arctic saw the maximum daily sea-ice extent with 14.78 million km², which was the 7th lowest maximum on record. On the other hand, on 18 September 2019, the minimum daily sea-ice extent is 4.15 million km², which was the second lowest on record.

Drivers of short-term climate variability

The El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) are two major factors that can help to understand the climate of 2019. The El Niño-Southern Oscillation is one of important drivers of year-to-year variability in global weather patterns. The ENSO is an irregularly periodic variation in prevailing winds and sea-surface temperatures over the tropical eastern Pacific Ocean, affecting the climate of much of the tropics and subtropics. El Niño is characterized by warmer than average

sea-surface temperatures in the eastern Pacific and a weakening of the trade winds. On the other hand, La Niña is characterized by cooler than average sea-surface temperatures in the eastern Pacific and a strengthening of the trade winds. The 2019 El Niño conditions are weak with sea-surface temperatures reaching or slightly exceeding typical El Niño thresholds as well as the atmospheric change not being evident.

The IOD is an irregular oscillation of sea-surface temperatures in the Indian Ocean. The positive phase of the IOD is characterized by cooler than average sea-surface temperatures in the eastern Indian Ocean and warmer than average sea-surface temperatures in the west. The negative phase has the opposite pattern. The change in the gradient of sea-surface temperatures across the Indian Ocean affects the weather of the surrounding continents. In 2019, the IOD started positive and became progressively more positive from May to October, ultimately becoming one of the strongest positive IOD events since reliable records began around 1960.

High-impact events in 2019

Climate change is causing a wide range of high-impact events, which are also called as extreme events or extreme weather events, including heat waves, drought, heavy rainfall, tropical cyclones, severe storms, and wildfires. The year 2019 saw numerous high-impact events. As an illustration, the two most significant heatwaves occurred in late June and late July. The former one reached its maximum intensity in southern France, where a national record of 46.0°C. It also affected much of western Europe. The latter one was more extensive, with national records set in Germany (42.6°C), the Netherlands (40.7°C), Belgium (41.8°C), Luxembourg (40.8°C) and the United Kingdom (38.7°C). The heat also extended to the Nordic countries, where Helsinki has its highest temperature on record (33.2°C) on 28 July. Furthermore, heatwaves, combined with long periods of drought, were linked to wildfires of unprecedented size. This was the case in Australia, where millions of hectares were set ablaze, and in Siberia and other Arctic regions hit by wildfires of record intensity.

Risks associated with high-impact events

The risks depend on the complex interactions between the high-impact events (e.g., heat waves, drought, tropical cyclones and wildfires) and the vulnerability, exposure and adaptive capacity of human and natural systems. These high-impact events pose risks to human health, food security, livelihoods, economies, infrastructure, biodiversity and ecosystem services. As an illustration, extreme heat conditions threaten human health, taking an increasing toll on people, particularly aging populations. In addition, they also increase the risk of vector-borne diseases, such as mosquitoes transmitting the dengue virus. In 2019, the world experienced a large increase in dengue cases, compared with same period in 2018.

As for the risk regarding food security, it is noted that rising global temperature and changing rainfall patterns have already affected terrestrial ecosystems such as forests and grasslands, as well as agricultural lands and crop yields. Climate variability and extreme events are among the key drivers of the recent rise in global hunger. Over 820 million, or one in every nine people in the world, suffered from hunger in 2018. The situation is most acute in sub-Saharan Africa, where the number of undernourished people increased by more than 23 million between 2015 and 2018, particularly in countries affected by conflict such as Democratic Republic of Congo, Republic of South Sudan and Nigeria. In light of this, it is an enormous challenge to meet the Zero Hunger target of the 2030 Agenda for Sustainable Development.

Urgent Mitigation of the Ecological Disaster on Formosa Bank

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Translated by Linguitronics

Keywords: bank, maritime ecology, fishing economy

In recent years, a large number of Mainland Chinese sand-pumping vessels have been dredging sand from South Bank, an important fishing ground for fishers from Penghu. This has significantly damaged the ecological environment of the seabed and threatens the fishing resources on which Penghu fishers depend for their livelihoods. There is an urgent need to strengthen the ban on such operations and stop illegal sand pumping as soon as possible to maintain the sustainable use of the ecosystems and fishing resources on Formosa Bank.

The Ecological Environment of the Formosa Bank

The Formosa Bank, also known as South Bank, is located southwest of the Penghu Islands, where it forms a fan-like shape in the southern part of the Taiwan Strait. Located in the area covering 117°40'-119°20' east longitude and 22°30'-23°20' north latitude (Figure 1), the center of the Formosa Bank is approximately 80 nautical miles from Magong, and its northern border about 30 nautical miles from Chimei Island. According to Wen-Shu Koo (2017), the sedimentary deposit carried to this area by the southeastern rivers of China in the Last Glacial Period formed a river delta. Quartz, a coarse sediment, is the main substrate of the seabed here; the closer to China and the Penghu Islands, the higher the proportion of feldspar in the seabed. The water depth in this area is shallower than 40 meters, with the shallowest part being 8.6 meters; it is a large sandwave field that covers approximately 13,000 square kilometers. On the seabed, the sandwaves are 3 to 25 meters in height and 300 to 1,000 meters in length. The directions of the sandwaves are NNW to SSE and WNW to ESE; they are nearly perpendicular to the direction of the tidal current. According to the accounts of past fishing experiences reported by experienced divers in Penghu, the Formosa Bank is home to numerous coral reef fish. No academics had done an underwater survey of the coral reef distribution here, therefore, I personally took a plane and observed the distribution of fringing reef formations on the Formosa Bank from the window. I speculate that this area may have a great coral reef ecosystem.



Figure 1/Geographical Location of Formosa Bank
Image by Ming-Shiou Jeng

Abundant Resources for the Fishery Industry

The Formosa Bank is the biggest traditional fishing ground in Penghu. So far, 199 species of benthic fish have been discovered here (H. C. Yang, 1974). Among them, the main species that contribute economically to the fishery industry include the Spanish mackerel, myopsina (small squid), round herring, sillaginidae, largehead hairtail, and decapterus maruadsi (mackerel scads), all of which spawn or are bred here. Reports from Taiwan's Fisheries Research Institute indicate that, because the Formosa Bank and the Penghu Islands are located right in the middle of the Taiwan Strait, in the summer they are influenced by the monsoon current and the Kuroshio current flowing northerly from the South China Sea. This regularly produces upwelling, which forms cold water masses rich in nutrient salts (rich in Chlorophyll A and supports high primary production). Jinn-Shing Weng, et al. (2020) reported that the spawning season of the Spanish mackerel is from March to August, and that the Formosa Bank is the species' main spawning ground. Moreover, from 1970 to 1990, Penghu's fishery industry chiefly consisted of small squid and round herring, which accounted for 90% of the entire province's production and formed the economic lifeline of Penghu. The fishing ground for these species is right near the Formosa Bank. These main commercial fish species are migratory fish that gather in massive schools and are caught in large quantities. The Formosa Bank is their brooding and spawning ground, indicating that the marine ecological environment of the Formosa Bank constitutes optimal conditions. If extensive sand dredging changes the seabed habitats and hydrographical conditions, these migratory fish will move away or even die out. There are also many high-value benthic species, including the grouper, azurio tuskfish, and spanner crab, all of which will also disappear due to habitat degradation or ecological collapse.

The Pumping of Sea Sand is the Biggest Danger

Years of observation by Penghu fishers and conservation organizations have revealed that numerous iron sand-pumping vessels and carrier vessels have been regularly gathering on the Formosa Bank in recent years. It is likely that they remove up to hundreds of thousands of tons of sand each day, which will trigger structural changes in the sand and gravel layer of the seabed. This will in turn cause hydrological disasters in the nearby waters and destroy the habitats of tens of thousands of marine creatures. This is a precursor to the collapse of the Formosa Bank marine ecosystem.

Because the Formosa Bank is located on the centerline in the Strait, neither side of the Strait has administered this area for many years. As the economy of Mainland China has been growing rapidly, various regions are faced with serious shortage of sand and gravel for infrastructure construction. The sand extracted from Mainland China's rivers and coasts is not enough, and the Chinese government has strictly prohibited sand pumping, as it can damage the ecosystems of rivers, which can lead to the recession of riverbanks and coasts. As a result, the operations of sand-pumping vessels have been expanding from the coast of Fujian to the centerline of the Strait. In the past three years, the operations have expanded beyond the centerline and entered Formosa Bank and the waters near Chimei Island of Penghu. Huge profits from sand pumping have spurred larger and larger constructions of sand-pumping vessels and carrier vessels; many carrier ships that can load 50,000–60,000 tons have even appeared. In the early years, bottom trawling boats from Mainland China had nearly annihilated the coral reef ecosystems on the seafloor. Today, with hundreds of sand-pumping vessels illegally stealing sand, the marine ecosystem of Penghu's banks is in need of immediate rescue.

Bans Strengthened by the Coast Guard Administration

On October 24, 2019, four ships and two small vessels sent by the Coast Guard Administration of the Ocean Affairs Council joined hands with the Penghu county government personnel as they began

enforcing the ban with resolution. In the waters of the Formosa Bank, they detained the 4,266-ton sand-pumping vessel "Feng Yi 9969" and the 27,711-ton carrier vessel "Chang Xin 36," along with the 27 crew members. They were brought back to Magong; and the investigation was directed by the Penghu District Prosecutors Office. In Taiwan, this is the first case in which Article 18 and 20 of the Law on the Exclusive Economic Zone and the Continental Shelf of the Republic of China and Article 36 of the Sand and Gravel Excavation Act were cited. The Penghu District Prosecutors Office even took the unprecedented step of taking all of the 27 Chinese crew members into custody; the entire case was transferred to the district court.

On February 8, 2020, for the first time in the history of the Republic of China jurisdiction, the Law on the Exclusive Economic Zone and the Continental Shelf of the Republic of China was used to bring the matter of illegal sea sand stealing by Mainland Chinese sand-pumping vessels to trial. In the end, the two captains were sentenced to six months in prison each, and each of the 25 crew members were sentenced to 5 months in prison. The two ships, "Feng" and "Chang," along with the illegally obtained 16,500-metric-ton sand and gravel were confiscated. On February 12, the Coast Guard Administration dispatched two ships and four boats to escort "Feng" and "Chang"; one of the two ships was escorted to be berthed at Singda Harbor, and the other one at the Kaohsiung Port. The auction for these ships will be announced by the district prosecutors office. The announcement of this ruling is of great significance and regarded as an important benchmark. It reaffirmed Taiwan's determination to guard land resources and protect marine ecosystems.

Since 2018, the Coast Guard Administration has been making great achievements, especially throughout 2019; that year saw 456 cases in which Mainland Chinese vessels were cracked down on, and the detaining of 586 crew members who crossed the border. Among which, 81 vessels had crossed the border to fish; 7 vessels had illegally pumped sand; and 1,684 Mainland Chinese vessels were forcibly removed. The total amount of penalty exceeded NT\$68.25 million. Today, seizures, sentencing, fines, and ship auctions are effective measures supported by the legal and judicial systems. It is believed that persistent and aggressive measures are what will save the ecosystems of the Formosa Bank.

The Protection of the Formosa Bank Cannot Just Rely on Vigorous Law Enforcement

Formosa Bank may not see peaceful days when people are driven by profiteering. After all, in addition to tough approaches to law enforcement, inter-ministerial cooperation is also needed to cooperatively protect the marine environment and ecosystems. Judicially speaking, it is generally known that there are mutual aid associations for Mainland Chinese vessels. When one vessel is detained, other vessels will gather the amount of bail money needed. This allows vessels to cross the border frequently and disregard fines. However, in this case, the Penghu District Court only sentenced the two captains to a six-month prison term each, and the 25 crew members to a five-month prison term each, which could be commuted to fines. The bail payments were completed within a few days after the ruling. If the prison term was commuted to NT\$1,000 a day, each crew member needed only about NT\$150,000, and each captain about NT\$180,000, making a total amount of NT\$4.26 million in penalties. Such penalties are not considered high, and thus the deterrent effect is limited.

According to the estimation by Chia-Liang Yang (2020), a Taoyuan city council member, the price of sea sand per cubic meter is HK\$200 (equivalent to about NT\$780). In this case, 16,500 tons (about 11,000 cubic meters) of sand was obtained through illegal pumping, which is equivalent to NT\$8.58 million at market price. Therefore, one single sale of sea sand would be enough to obtain the bail money for all of the crew members, while also deriving a profit. This means that even if the ship was confiscated, the incomes generated through illegal sand pumping by other vessels of the organizations behind the

operations would be enough to make up for losses. Given these conditions, how will crimes be deterred? It is recommended that, for similar cases that transpire in the future, the managing court should not only confiscate the sea sand, detain and auction the vessels, but also reasonably increase the defendants' prison terms. The laws should be amended so that the commutation of sentences to fines be increased to NT\$2,000 or NT\$3,000 a day, which will effectively deter the operators behind sand pumping.

Conclusion and Recommendations

Although the Formosa Bank hosts rich fishing resources, most people of the country remain unaware of it. In addition, there are very few scientific research studies and surveys relevant to the marine ecosystems in this area. It is only because Tsien-Lung Liu from the Fisheries Research Institute began investigating surveys on the fishing grounds for round herrings and small squid on the Formosa Bank in 1967 that survey data continued to emerge in subsequent years (Tzay-Her Lu et al, 1989). Such data came along with the harvests of fishing boats with stick-held dip nets and seine nets. Due to the sharp decline in round herring and small squid in recent years, catching Spanish mackerels with gill nets has become Penghu fishers' main line of sustenance. Spanish mackerel, which is referred to as "Penghu platinum," generates huge profits for Penghu fishers. Secondary to that, benthic creatures are captured through long-line fishing, bottom gillnetting, pole-and-lines fishing, and cage-crabbing. Due to the large-scale illegal sand pumping conducted by Mainland Chinese vessels, the ecosystems on the seabed have changed drastically. Benthic fishery resources have almost died out; there is an urgent need for immediate rescue. As we all know, maintaining the health of the marine environment is an unshakable responsibility of politicians. In the future, we should not only strengthen the ban on illegal activities, but also work together to maintain the health of the Formosa Bank's marine environment through mutual trust and understanding between the two sides of the Strait. Putting together the current state and visions for the future, the following four recommendations are formulated:

- I. Inter-ministerially integrate governing bodies, including the Ministry of Justice, Ocean Affairs Council (Coast Guard Administration), Ministry of the Interior, Ministry of Foreign Affairs, and Mainland Affairs Council to cooperatively make law amendments in response to these situations and enforce the law.
- II. Mainland China and Taiwan should join efforts as soon as possible to crack down on sand pumping vessels and prevent the seabed of the Formosa Bank from receiving increasing damage.
- III. It is recommended that the Council of Agriculture and Ocean Affairs Council prepare budgets for the execution of long-term monitoring and survey plans on marine ecosystems and fishery resources.
- IV. "Maritime reconnaissance and surveillance" and "law enforcement capacity" need to be strengthened and elevated so that deployed sea patrol fixed-wing aircraft or helicopters can monitor the vast ocean from the air in real time. In addition, the needs of "immediate" rescue or law enforcement should be met so that vessel dispatching and patrolling can be more economical and effective (Ying-Yen Liao, 2020).

With great sincerity, it is hoped that relevant government agencies will cooperate more to develop countermeasures that are more effective with the aims of guarding Taiwan's blue territory—Formosa Bank, maintaining the integrity of Taiwan's economic sea areas, protecting marine ecosystems, and ensuring the sustainable development of Taiwan's economic sea areas and marine resources.

Comparing Taiwan's and Japan's Action Plan of Marine Debris Governance

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Translated by Linguitronics

Keywords: marine debris, marine plastic, action plan

Marine debris has become the most discussed environmental issue in recent years. Research and countermeasures relevant to marine plastic are an emerging field that various countries' governments, academic research institutions, petrochemical industries, retail industries, and environmental protection organizations desperately want to gain in-depth understanding on. This paper reviews the contexts of Taiwan's and Japan's management of marine debris, compares the two countries' action plans, and uses them as references for future regional governance and Taiwan's international participation.



Plastics make up most of the marine debris that washes ashore

Image by Eric Dale/USFWS

<https://www.flickr.com/photos/183382590@N08/49276361977/>

The Context of Taiwan's Marine Debris Management

For a long time in the past, Taiwan lacked competent authorities that managed marine affairs, and the issue of marine pollution received little attention. Before the Ocean Conservation Administration (OCA) of the Ocean Affairs Council was established, work related to marine pollution prevention was mainly under the jurisdiction of the Environmental Protection Administration (EPA). In 2002, the Department of Waste Management (DoWM) began promoting policies and setting standards for the usage restrictions on plastic items, including plastic bags, disposable tableware, and trays. However, before the announcement of restrictions on plastic particles in 2017, the relevant plastic reduction policies or regulations were not actually directly related to marine debris. In 2010, the Department of Environmental Sanitation and Toxic Substance Management (DoES&TSM) launched the Coastline Environment Cleanup, Maintenance, and Adoption Plan, which involved promoting coastline adoption, establishing the Facebook page "Beach Cleanup Groups," and other environmental protection work. In 2014, the Department of Water Quality Protection announced the Countermeasures Against

Marine Debris Caused by Land-based Pollution. In the following year, the "Floating Marine Debris Management Plan" was proposed, meetings dedicated to marine debris began to be held regularly, and underwater debris removals and investigations were launched.

Civil environmental NGOs in Taiwan have been giving attention to the issue of marine debris since 2000 at the earliest. The main activities they engaged in were exchanging experience with international allies, learning overseas beach cleanup statistics and survey methods, organizing seminars and workshops, organizing beach cleanups, and promoting plastic reduction policies. In 2008, The Society of Wilderness began organizing beach cleanups, actively educating the public, and recording beach cleanup data. After 2010, more civil organizations, schools, and societies joined beach cleanup efforts. In recent years, with the rise of social media, newly established NGOs, such as RE-THINK, and internet celebrities, including TKstory, have been encouraging the public to engage in beach cleanups, and their efforts were heard and heeded by thousands of people. Before 2010, the number of beach cleanup events was around 30-40 per year, and in the past three years, the number increased to almost ten thousand events every year, each being held at large scales and involving about 210,000 participants.

By 2017, the extent of marine debris issues had become more and more severe. Environmental NGOs formed an alliance and began lobbying the Environmental Protection Administration to establish an inter-ministerial top-level policy program. After six months of frequent discussions, the Action Plan of Marine Debris Governance in Taiwan (MDAP) was announced in early 2018. The public and private sectors joint hands to promote 76 operations formulated based on four main aspects: "source reduction," "prevention and removal," "research and investigation," and "cooperation and outreach." Environmental protection groups reported that, according to beach cleanup data from the past, straws, plastic bags, disposable tableware, and hand-held cups have been the most commonly seen trash on shores for many years. They also worked with the Environmental Protection Administration to formulate the timeline of single-use plastic utensils' reduction. Afterwards, the second phase of plastic bag and straw usage restrictions was announced, and the scale of disposable tableware control was expanded. In 2018, the OCA, Fisheries Agency, and four environmental protection organizations also joined the platform. Relevant progressive operations were formulated through regular meetings of the Marine Debris Governance Platform.

The Context of Japan's Marine Debris Management

Thirty years ago, in Japan, the civil organization JEAN (Japan Environment Action Network) started promoting beach cleanups and introduced the International Coastal Clean-up. In 2003, JEAN invited representatives of offshore islands, who were troubled by severe marine debris issues, to carry out the first Island Debris Summit, which was later developed into the national Umigomi (marine debris) Summit. The summit is organized by a different local government each year, and stakeholders affected by marine debris are invited to join the discussions. In 2006, civil organizations collected the demands of local regions and began lobbying the National Congress. In response to the proposals from local governments, the central government set up governmental meetings for marine debris-related matters.

In 2009, with the continuous promotional efforts of civil organizations, Japan passed marine debris management legislation, The Law of Promotion for Coastal Floating Debris Management (later renamed The Law of Promotion for Marine Debris Disposal). In 2010, the "fundamental policies" based on the aforementioned law were introduced. Local governments formulated regional plans based on the fundamental policies and promoted marine debris recycling, management, and prevention plans.

In accordance with the law, the Ministry of the Environment coordinated countermeasures for marine debris, formulated governmental fundamental policies, organized director-level meetings of promotion for marine debris countermeasures, and hosted expert meetings on marine waste countermeasures. The following operations were promoted by the Ministry of the Environment: 1. Removal and prevention of marine debris along the coasts of Japan. 2. Monitoring Japan's coastlines as well as the amounts and distributions of debris (including microplastics) and toxic substances present in the ocean. 3. Engaging in international cooperation with other countries in Asia, and establishing an international framework to tackle marine debris worldwide. In addition, the Ministry of Agriculture, Forestry and Fisheries and the Ministry of Land, Infrastructure, Transport and Tourism promoted marine debris removal from their standpoint of coastal-management. Through international cooperation, the Ministry of Foreign Affairs promoted the involvement of neighboring countries in discussions and diplomatically responded with respect to marine debris that had drifted to Japan from neighboring countries. At the local government-level, the Ministry of the Environment developed regional plans for local governments and established the National Marine Debris Measures Promotion Council.

The Law of Promotion for Marine Debris Countermeasures mainly focuses on the removal and final management of marine debris, yet it still lacks policies related to plastic reduction. In 2018, Canada proposed the Ocean Plastic Charter at the Group of Seven summit (G7), but the Japanese government refrained from signing the charter because "it had yet to formulate such laws in Japan." This decision subsequently stirred up criticism from Japanese citizens. The following year, before the G20 summit hosted by Japan, the Japanese government announced the Action Plan for Countermeasures Against Marine Debris and the Plastic Resource Recycling Strategy, which has goals similar to the "Ocean Plastic Charter." They serve as an integrated method for managing plastic waste. After the summit, G20 leaders issued the Osaka Blue Ocean Vision together, stressing their determination to reduce marine plastics by 2050.

Comparing Taiwan's and Japan's Action Plans

The four major aspects of Taiwan's marine debris action plan are mainly formulated based on the Honolulu Strategy released by the United Nations Environment Programme and US National Oceanic and Atmospheric Administration in 2011. The action plan was coordinated by the Environmental Protection Administration, and its emphasis was on the relevant plastic reduction regulations promoted by the Department of Waste Management. Ten years' worth of beach cleanup data gathered by civil organizations and citizen science was used by the Environmental Protection Administration to draft the 2019-2030 schedule for single-use plastic items, such as straws and disposable tableware.

Throughout, starting from the Marine Debris Governance Platform to developing the MDAP of Taiwan, Taiwanese civil organizations have played a key role in the overall policy making of marine plastics management. Taking the rapid assessment of coastal debris (under "research and investigation") as an example, in 2019, civil organizations Greenpeace and The Society of Wilderness identified 13 hotspots for coastal debris found by the four-seasons rapid assessment survey around Taiwan's coastline, which received extensive media coverage. As a result, the Environmental Protection Administration started to consult relevant coastal governing bodies, and also worked with various county and city governments to remove three main types of waste: coastal debris, abandoned fishing gear, and driftwood. Indirectly, they also prompted the Executive Yuan to introduce the Tribute to the Sea policy, which initiated inter-ministerial surveying and integrated coastal cleanup capacity.

Tribute to the Sea is the first high-level policy on the management of marine debris proposed by a high-level governing body. This shows that the issue of marine debris has been receiving increasing attention from the government and the public. In contrast to Japan, Taiwan has seen the vigorous energy of its civil societies. In recent years, the public sector, enterprises, and NGOs have all committed themselves to reducing plastics. It will be worthwhile to see whether Taiwan can continue to utilize cooperation between public and private sectors to reduce marine debris caused by land-based pollution, strengthen marine debris-related monitoring and investigation, and share Taiwan's marine debris management experience through international interactions.

Japan's plastic production is second only to the US, placing Japan at number two in the world. However, Japan's plastic recycling rate was only 23% in the past. In contrast to the way that "source reduction" is highlighted in Taiwan's action plan, Japan's action plan puts more emphasis on strengthening debris management and removal, as well as the development of innovative technologies that replace traditional plastic materials. Japan's Plastic Resource Recycling Strategy proposed the "3R Initiatives"-reduce, reuse, and recycle. The strategy aims to reduce 25% of single-use plastics, recycle 60% of containers and packaging, double the usage amount of recycled plastic materials, use 2 million metric tons of bioplastics by 2030, and achieve the effective use of 100% of plastic waste by 2035. Japan's action plan and strategies encourage industries to develop more alternative or biodegradable materials, but unlike Taiwan's action plans, they have not placed much attention on reduction.

In addition, Japan emphasized in its action plan the importance of using scientific research to effectively tackle the issue of marine plastics. For multiple times in the past, Japan used observation vessels to survey microplastics in the waters along Japan's coasts, distant seas, the Antarctic Ocean, and deep oceans. Long-term monitoring and investigations conducted by various local governments of the country have also created good understanding of the amounts of waste and sources of waste in rivers, lakes, and coasts. Furthermore, Japan's action plan also mentioned that the country can provide financial and technical assistance to developing countries (such as Bangladesh, Myanmar, and the Dominican Republic) through international aid to strengthen the management of marine debris. These two points are what is lacking in Taiwan's action plan. Since the OCA and the National Academy of Marine Research have been established, it is hoped that they will direct more research and investigations related to marine waste in the future.

Conclusion

Comparing Taiwan's and Japan's action plan of marine debris governance, although Taiwan's scientific research is progressing at a slower pace, the EPA, OCA, Fisheries Agency, and Taiwanese NGOs have formed the Marine Debris Governance Platform. Within a short period of time, they were able to promote policies, launch action plans, release clear schedules for reducing single-use plastic, and carry out beach cleanup and plastic reduction activities that have developed rapidly in various regions. These are amazing steps that have impressed other countries. Japan's action plan focuses on the removal of marine debris, innovation of plastic materials, and further development of industries. Its meticulous long-term research and investigation, as well as its capacity to provide international aid, are worthy of emulation in Taiwan.

A Key Opportunity for Asia-Pacific Cooperation: Highlights from the “Regional Conference and Policy Dialogue on Blue Economy, Ocean Tourism, and Sustainable Blue Financing”

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Translated by Linguitronics

Keywords: Blue economy, ocean tourism, blue financing

This article outlines the international conference on Blue Economy, Ocean Tourism, and Sustainable Blue Financing, hosted by the Asian Development Bank Institute (ADBI), the Ocean Policy Research Institute of the Sasakawa Peace Foundation (OPRI-SPF), and International Cooperation and Development Foundation (TaiwanICDF), in Nadi, Fiji during February 25-27, 2020.



Regional Conference and Policy Dialogue on Blue Economy, Ocean Tourism, and Sustainable Blue Financing
Image by OPRI-SPF

Introduction

In 2019, the Asian Development Bank (ADB) hosted the annual meeting to the Pacific island country – Fiji for the very first time, signifying the ADB's announcements for its Ocean Financing Initiative and Healthy Oceans Action Plan, as well as investment of US\$5 billion by 2025 to promote related projects. From February 25 to 27, 2020, the ADBI, the OPRI-SPF, and TaiwanICDF collaboratively hosted an international conference on “Blue Economy, Ocean Tourism, and Sustainable Blue Financing” in the warm weather of Fiji. The conference is part of ADBI's and OPRI's research, capacity building and sessions. Nearly 100 people attended with backgrounds of industry, government, and academia from 15 countries, including Asian and Pacific countries and the US. The conference consisted of 15 academic reports and policy dialogues. During the 3-day conference, scholars and officials from different countries discussed how to develop blue financing measures to nurture ocean resources and to promote ocean economy.

Ambassador Jessica C. Lee, Representative of the Taipei Trade Office (TTO) in Fiji, was invited to deliver a speech. She introduced TaiwanICDF's projects that utilize blue economy concepts and the aquaculture and restoration projects in collaboration with Fiji and the Marshall Islands to improve aquaculture product yield and ensure sources of protein. Another project is a collaboration with Palau for coral reef conservation through advanced technology and ocean governance. Dr. Miko Maekawa, Senior Research Fellow of the OPRI-SPF, mentioned during her opening speech that many key ocean meetings will be hosted this year, which will make this year a "super" year for oceans; such conferences include the United Nations (UN) Ocean Conference. Cooperation between areas can speed up the achievement of goals and create knowledge platforms. She also expressed gratitude to the TaiwanICDF for cooperation in sustainable ocean development, and to the TTO in Fiji for much needed assistance in the conference. Dr. Ted C. Chuang, Deputy Minister of Taiwan's Ocean Affairs Council, participated as Taiwan's governmental representative. He made his presentation in the first meeting after the opening on the topic "Blue Economy and Climate Adaptation," in which he introduced the vision of the Council and its major tasks that echo the UN's Sustainable Development Goal 14 (SDG14)—Life below water. TaiwanICDF's long-term dedication in supporting Pacific islands was also confirmed by all parties present. A display board was specially set up during the conference to exhibit project outcomes, and many participants were drawn to the board for further study or a photo.



Left: Policy forum; Middle: Deputy Minister Ted C. Chuang of Taiwan's Ocean Affairs Council delivering his talk; Right: participants came from various government ocean agencies
Images by OPRI-SPF

Conference summary

I. Blue economy with adjustments made for climate change

The Stimson Center in Washington, DC, is one of the main founding members of Our Ocean Conference, a major annual ocean conference, that participates actively in UN Ocean Conference projects and initiatives. Mr. Jack Stuart presented in this conference the Climate and Ocean Risk Vulnerability Index (CORVI), a cross-national research. The CORVI project is currently operated in partnership with the OPRI-SPF, collecting data gradually from the Caribbean and South Pacific island countries. Plans are under way for expanding the study areas to South Asia and Southeast Asia. The research uses expert evaluation index that groups ocean risks into ecological, political, and financial risk categories. The 10 main indicators include surveys of experts from different disciplines, and provide a general comparative ocean risk assessment for each indicator. The significance of this study is to form a global compilation of ocean risks, instead of an evaluation based on absolute development data. The index helps create visualized overall comparisons, allowing more financial or insurance organizations the opportunity to offer proper evaluations. The study is still in its early phase and will continue in various countries, with results expected to be presented at the UN Ocean Conference. It is desired that more countries and research institutes may join in to apply the ocean risk vulnerability index in more aspects.

II. Structure of blue financing

The application of blue financing is a relatively new concept in the ocean industry. The system allows ocean environment-friendly sectors to raise funds for development. According to the 2019 annual report by UK organization Climate Bonds Initiative (CBI), the market for green financing is already near US \$167.6 billion, but marine applications are as yet quite limited. Professor Raghu Dharmapuri Tirumala of the University of Melbourne, Australia, proposed an analytical structure based on traditional green financing created by ADB. The blue finance accelerator estimates specific interest rate reduction as an incentive to accelerate formation of the blue finance market. Ms. Nagisa Yoshioka from OPRI-SPF presented the joint study between OPRI and Professor Hsing-Hao Wu from Department of Economic and Financial Law, National University of Kaohsiung. The study advocates for blue financing regulations, and roles within the system all have their own properties and scopes of interaction. Mutual benefits are described through analysis of their interests. For example, NGOs and NPOs focused on marine protection obtain funds through various interactions with development banks. Alternatively, there is the role of private businesses. For sectors that may gain relatively large profits, such as offshore wind farm, a contribution to blue financing should be obligatory by initiating the first fund ocean development. In contrast to green financing environment indices, the detection of ocean development requires much more scientific input. Therefore, developing island nations need to work more closely with ocean-related research think tanks, providing evidence-based analysis and promoting financial circulation.

III. Ocean disaster management and ocean governance

Quantitative analysis of ocean disaster risk management also serves as important reference for financing. Mr. Hajime Tanaka from OPRI-SPF utilized GIS and hazard maps in Southern Hokkaido region of Japan, to proceed impact assessment of tsunamis on industry-specific buildings in different areas as well as reconstruction cost estimate. The simulation results show that the capital-use subsidies for the seafood production industry in coastal cities have the largest benefit on society and economy, and will promote the revitalization of other fishery-related industries. The empirical research has a wide scope for application, and can serve as a reference for policy-making in other countries regarding relatively vulnerable industries, in hopes of contributing to disaster prevention. Senior Research Fellow, Dr. Michelle Voyer of the Australian National Centre of Ocean Recourses and Security (ANCORS), University of Wollongong, Australia, presented the concept of blue governance as guided by blue economy, highlighting the integration of various organizations and coastal management. A global ocean account should also be created based on comprehensively surveyed ocean information to gradually identify the development processes of society, economic activities, and ocean conservation, and assess and address each goal.

IV. Regional focus

United Nations Development Programme (UNDP) resident economist – Dr. Rima Prama Artha presented the evaluation projects by the UNDP in Indonesia. The Indonesian government collaborated with major private banks to combine Sukuk funds, corporate social responsibility (CSR), and related global funds of US\$2 billion to establish the Green Sukuk, green financing in the local language. In the future, its scope will be extended to oceans. It is expected to help broaden public-private partnership, with each application assessed in 3 weighted categories, environment (50%), economy (25%), and society (25%). Main development areas are sustainable fishery, renewable ocean resources, ocean waste management, marine ecology restoration, and disaster management. Meanwhile, Mr. Alvin Joeshar of the Central Bank of Indonesia and Mr. Ahmad Pakihadina Rahmatulloh of Resona Bank gave thorough introductions on related public and private sector measures, displaying close collaboration among industry, government, and academic circles.

V. Policy dialogue

The policy dialogue began by Mr. David Kolitagane, Permanent Secretary from Fiji's Ministry of Rural and Maritime Development, who delivered the keynote address in which he emphasized the relation between ocean economy utilization and development and confirmed that policy recommendation through empirical research will improve governmental measures through various quantitative analyses. Ms. Hanna Uusimaa, Climate Change Specialist from the ADB Pacific Department, explained the ADB Action Plan for Healthy Oceans, clarifying and discussing its content with state and organization representatives. As governmental representative, Taiwan's Ocean Affairs Council Deputy Minister Chuang, who reported how Taiwan's textile industry used disposed plastic bottles as raw material for sportswear and promoted the textiles to the world. He also proposed in his talk to assist Pacific countries with sea freight systems for plastic waste shipping and integrated collection. Besides being recovered, the plastic waste can be further transformed into economical products. Fiji's Ministry of Rural and Maritime Development Permanent Secretary Kolitagane responded immediately to the Taiwan proposal, declaring challenges for local waste disposal and looking forward to keeping close contact and discussing solutions with Taiwan, anticipating the realization of the South Pacific processing plan. Specialists from ADB agreed that this type of environmental plan has much economic potential, especially where the resource recycling process creates economic benefits to economic development. It also serves as a basis to help ADB decide whether to provide funding or support.

Conclusion and Recommendations

At the closing ceremony, ADBI Vice Chair of Research, Dr. Peter Morgan acknowledged that state representatives and presenting scholars had adequate discussions during the conference, both within scheduled conference sessions and at dinner parties. This means that vivification and development of healthy oceans, blue economy, and blue financing can become popular subjects internationally. Once revised, the reports presented in this conference shall be officially sent to the international journal *Marine Policy* for a special issue on the topic "blue economy and finance," in hopes of gaining even more academic and policy discussions. The leader of TaiwanICDF in Fiji, Mr. Dominick Lee made a speech as well, and shared guavas grown by the agricultural technical mission with the audience in "Fruit diplomacy" on all sides.

CBI research shows that the Asia Pacific has become the area where environmental financing is developing fastest. How we can leverage the rising awareness for environment conservation and market vitalization, establishing regulations that coexist with the ocean, and allow sustainable resource development, is essential. To achieve this effectively, it is most critical to promote two- or multi-sided close policy connections through think tanks. Especially as Japan and Taiwan are highly complementary in terms of technology, human resources, and foreign affairs, their destinies are entwined. So, it is ever more necessary to nurture marine talent, strengthen international participation, and deliver the clear message of protecting ocean sustainability to the world, all based on the shared value of sustainable ocean development. The next conference will be held at ANCORS, University of Wollongong, Australia, in November 2020, when it is expected that research on blue economy and blue finance will shine with an abundance of intellect.

Japan's Headquarters for Ocean Policy and Ocean-related Government Agencies

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Translated by Linguitronics

Keywords: Headquarters for Ocean Policy, Basic Act on Ocean Policy

In January 2001, Japan underwent a large-scale government streamlining reform. This article will introduce the 10 ministries and agencies related to maritime affairs after the restructuring and merging.

Introduction to Japan's oceans

Japan is an island country made up of Hokkaido, Honshu, Shikoku, Kyushu, Okinawa, and 6,852 remote islands in varied sizes, according to household registries, 314 of the island are populated. The country's coastline is the 7th longest in the world, and half of the Japan's total population lives in coastal areas (Wikipedia, 2020. Retrieved from <https://reurl.cc/3DY1xl>, Apr. 8, 2020).

Furthermore, Japan is the only country in the world that have national holiday that memorializes the ocean. Which is at the third Sunday of July is "National Ocean Day", and its main intention is to thank the ocean for its graces while praying for the prosperity of Japan, a maritime nation. The importance of the ocean to Japan is apparent.

Agencies involved in ocean policies in Japan

At the past several government agencies were involved in the management of Japan's maritime affairs, so responsibilities were severely split up, decisions could not be made in time, and international trends in ocean issues were out of reach. In January 2001, Japan underwent a large-scale government streamlining reform. After the restructuring and merging, agencies that are now related to maritime affairs include:



Cabinet Office Building (Japan)

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<https://zh.wikipedia.org/wiki/File:Naikakufu1.jpg>

I. Headquarters for Ocean Policy

In 2007, the Cabinet Office established the Headquarters for Ocean Policy as per Japan's Basic Act on Ocean Policy (Article 38, Act No. 33, 2007). The Headquarters oversees all of Japan's ocean policies, specifically the planning, formulating, inspecting, reviewing, and promoting of Japan's mid- to long-term ocean policies; implements the Basic Plan on Ocean Policy; and coordinates administrative affairs between maritime ministries and agencies.

Also, 10 marine specialists have formed a "participating council" that is above the Headquarters for Ocean Policy. The council offers comments through meetings to maintain effective general management, survey, and review on ocean affairs, it was the council that established the Basic Plan on Ocean Policy.

The Japanese Prime Minister is Director-General of the Headquarters for Ocean Policy, and the Chief Cabinet Secretary and Minister of Land, Infrastructure, Transport and Tourism serve as vice directors-general. The Minister of Land, Infrastructure, Transport and Tourism are also Minister for Ocean Policy, in charge of affairs with regard to formulating the Basic Plan on Ocean Policy.

II. Cabinet Secretariat

The Cabinet Secretariat prevents terrorist attacks, guards against international crime, control the access of human and objects. An Assistant Chief Cabinet Secretary, is a part of the Cabinet Secretariat, is in charge of emergency response and crisis management. The Airport/Seaport Border Crisis Management Team under this Assistant Chief Cabinet Secretary has managers of Airport/Seaport Crisis Management and Airport/Seaport Security Committees set up in airports and seaports to assist in improving seaside security and crisis management.

III. Ministry of Land, Infrastructure, Transport and Tourism

Japan's Ministry of Land, Infrastructure, Transport and Tourism has responsibilities that are equivalent to Taiwan's Ministry of Transportation. It is in charge of various issues, including national land planning and development, building of infrastructure, transportation, meteorology, maritime safety, and tourism promotion. The Ministry's Maritime Bureau and Ports and Harbours Bureau are responsible for ocean surveys, meteorological observation, maritime affairs, marine transport, ships, ocean security, port and harbour management, ocean use, prevention of ocean pollution, marine traffic safety, seacoast management, sewage management, national land planning, urban planning, ocean area management and coastal area management.

The Japan Coast Guard is a specially estimated external bureau under the Ministry of Land, Infrastructure, Transport and Tourism. The Japan Coast Guard's chief missions are including maintaining ocean security, ensuring maritime traffic safety, coastal rescue operations, preventing marine disasters, protecting ocean environments, managing maritime traffic, sea mapping and related oceanographic information (waterway) affairs, maritime route marking and management, and collaborating and exchanging with foreign countries to improve ocean environment security. The Hydrographic and Oceanographic Department under the Coast Guard is in possession of Japan's oceanographic database and provides various of oceanographic information to marine scientific research agencies.

IV. Ministry of Education, Culture, Sports, Science and Technology

The Ministry of Education, Culture, Sports, Science and Technology is equivalent to Taiwan's Ministry of Education. Agencies under this Ministry are including the Science and Technology Policy Bureau, the Research Promotion Bureau, and the Research and Development Bureau. They are in charge of the planning and drafting of research on marine science and technology, earth science and technology, and environmental science and technology. The Ocean and Earth Division is under the Research and Development Bureau is in charge of research on global warming and related issues.

V. Ministry of Agriculture, Forestry and Fisheries

The Fisheries Agency under the Ministry of Agriculture, Forestry and Fisheries is responsible for ship management, fishery and aquatic product resource management, and promotion of fishery industry development. The Whaling Affairs Office under the Fisheries Agency controls the number of whales that are capture each year, finding a balance between Japan's whaling culture and the waves of protest from around the world.

VI. Ministry of Economy, Trade and Industry

The Agency for Natural Resources and Energy and its Energy Conservation and Renewable Energy Department, Natural Resources and Fuel Department, and Electricity and Gas Industry Department are Under The Ministry of Economy, Trade and Industry, involved in marine energy resource affairs.

VII. Ministry of Environment

Units under the Ministry of Environment include the Environmental Health Department, the Global Environment Bureau, the Water and Atmospheric Environmental Management Bureau, and the Nature Conservation Bureau. The Global Environment Bureau is in charge of preventing global warming and decreasing ozone depletion. The Nature Conservation Bureau is in charge of establishing marine protected areas, preserving marine biodiversity, and protecting coral reefs.

VIII. Ministry of Foreign Affairs

The 4 main functions of the Ministry of Foreign Affairs are economy, international assistance, international law, and consular affairs. The Space and Maritime Security Policy Division under the Ministry's Foreign Policy Bureau handles piracy issues. The Law of the Sea Division within the International Legal Affairs Bureau is in charge of maintaining ocean security. The Fishery Division under the Economic Affairs Bureau is in charge of international fishery issues, especially ocean fishery issues in relation to the government and foreign countries. And under the Director-General for Global Issues within the International Cooperation Agency, the Specialized Agencies Division takes charge of International Maritime Organization (IMO) related affairs, while the Global Environment Division is responsible for marine environmental protection and the implementation and utilization of international agreements (refer to figure below).



Units within the Ministry of Foreign Affairs that are related to ocean policy
Consolidated by this study

IX. Ministry of Defense

The Maritime Staff Office under the Ministry of Defense controls military administration and orders for the Japan Maritime Self-Defense Force (JMSDF). Within the Maritime Staff Office, the Chief of Staff specializes in managing the JMSDF's defense, training, equipment, and human resources, as well as planning ocean safety technology projects, planning at-sea disaster prevention projects, developing ocean information and communication technology, and performing ocean security activities.

Due to the splitting up of duties and lack of coordination between Japan's ocean-related government agencies in the past, the Headquarters for Ocean Policy was established and reorganized to be lie within the Cabinet Office rather than the Cabinet Secretariat (Nikkei, 2017. Retrieved from <https://reurl.cc/ZObn2V>, Apr. 8, 2020), and it has authority to supervise all ocean policies and ocean affairs. The official implementation of the Basic Act on Ocean Policy and the establishment of the Headquarters for Ocean Policy, have indicated that Japan has started to focus on improving development of ocean resource, and following the global maritime management trends; moving towards being a great maritime nation.

An Introduction of Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

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Keywords: National Oceanographic Research Institute, JAMSTEC, Earth Simulator, D/V ChiKyu, deep submersible, Research Vessel

The purpose of this report is to introduce the recent organizational development of JAMSTEC and its core competencies, in the hope of enhancing our understanding of marine scientific research institutions in neighboring countries and as a reference for setting benchmark institutions.

The establishment of a national marine research and development organization in Japan can be traced back to the establishment of the Japan Marine Science and Technology Center (JAMSTEC) on October 1, 1971 as a specially recognized corporation. Subsequently, with the adjustment of Japan's public corporation system, it was transformed into JAMSTEC as an incorporated administrative agency in April 2004, and was transformed into a national research and development agency under the authority of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) after the amendment of the "Act on General Rules for Incorporated Administrative Agencies" in April 2015.

Purpose and mission

Under the Act on JAMSTEC, National Research and Development Institute passed in 2019, the JAMSTEC was established with the mission to "support our society in achieving this goal, through developing new scientific and technological capabilities which contribute to the sustainable development, and responsible maintenance, of a peaceful and fulfilling global society." The agency is to perform the following operations to attain the objective: 1. conducting experiments and research in science and technology; 2. disseminating the results obtained by carrying out the operations stated in the preceding item and promoting their utilization; 3. providing the facilities and equipment of the agency for public utilization with persons who conduct experiments, research and development in marine science and technology; 4. developing scientific equipment and support related academic research; 5. training researchers and technicians in marine science and technology and enhancing their level of expertise; 6. collecting, organizing, storing, and providing data and information on marine science and technology in Japan and abroad; 7. performing operations incidental to the operations stated in the preceding items.

Organization and scale

JAMSTEC operates as a legal entity, with a executives team and seven research and development departments, including the Research Institute for Global Change (RIGC), Research Institute for Marine Resources Utilization, Research Institute for Marine Geodynamics (IMG), Research Institute for Value-Added-Information Generation (VAiG), Institute for Extra-cutting-edge Science and Technology Avant-garde Research (X-star), Super-cutting-edge Grand and Advanced Research (SUGAR) Program, Advanced Science-Technology Research (ASTER) Program, Kochi Institute for Core Sample Research (KOCHI), Institute for Marine-Earth Exploration and Engineering (MarE3) and Project Teams, as well as eight research support departments. The research institute is located in Yokosuka City, and has established research institutes, centers, and offices in Yokohama City, Rokio City, Aomori Prefecture, Nankoku City, Kochi Prefecture, Nago City, Okinawa Prefecture, and Tokyo, respectively.

In terms of human resources, JAMSTEC's full-time staff at the end of April 2019 included 5 executives, 312 researcher, 208 technician, 39 crew members, 168 affairs staff, and 214 support and subordinate staff, making a total of 946 staff, with a budget of ¥35.8 billion yen for the same year. According to the budget and manpower statistics for the past 15 years (Figure 1), the total budget in 2012 was as high as ¥80.6 billion yen, and the manpower reached 1,067 people in 2015, in order to respond to the needs of the 2011 Tōhoku earthquake and tsunami Northeast Earthquake marine research survey.

Marine survey and research equipment

As Japan's core research institution for marine earth exploration, JAMSTEC is internationally known for its three major instruments, the Earth Simulator, the D/V ChiKyu, and the SHINKAI 6500 Deep Submersible, and for its excellent fleet of research vessels that support Japanese and international cooperation programs.

I. Earth simulator

Since March 2002, JAMSTEC has been working on a project called "Earth Simulator", the world's fastest computer for analyzing and predicting climate change, in the Earth. Its contribution is not only compiled in the report of the

Intergovernmental Panel on Climate Change (IPCC), but also in the use of materials, instruments, equipment, pharmaceutical development and other oriented applications.

The third-generation Earth simulator, updated in 2015, consists of NEC's SX-ACE supercomputer with a maximum theoretical performance of 1.3 PFLOPS, and will be used to address environmental problems and crustal changes, earthquake occurrence mechanisms and tsunami disaster prediction.

II. D/V ChiKyu

In 2005, Japan completed the construction of the D/V ChiKyu, a 56,752-ton offshore drilling vessel with a capacity of 200 crews (including 50 scientists and 50 drilling technicians), in order to further develop into a marine and technology power.

The D/V ChiKyu is committed to carrying out work on issues related to the mystery of life, global change, climate change and Earth history, and the drilling program is approved by the International Ocean Discovery Program (IODP). The D/V ChiKyu provides more reliable and safe drilling technology and equipment, and is equipped with precision instruments such as multi-sensor core logger (MSCL), X-ray CT scanner, optical emission spectrometry and other precision instrument for scientists to conduct preliminary studies of the core on board. The D/V ChiKyu previously set a record for the largest drill depth of 3,058.5 meters under the seafloor during a NanKai trough drill test in 2014. Most of the cores drilled were sent to the Kochi Institute for Core Sample Research for storage in a cold storage facility at 4°C. The total length of the cores in storage exceeds 120 km.

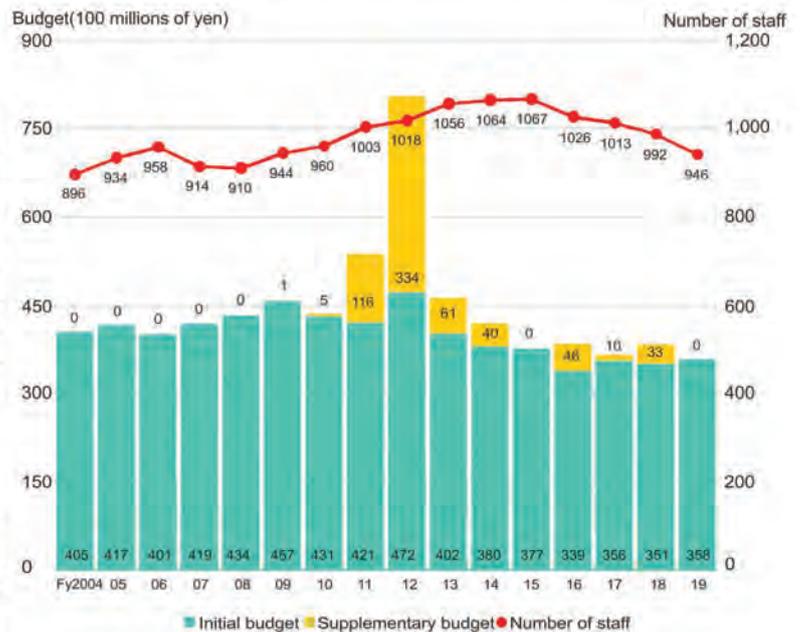


Figure 1/ Changes in JAMSTEC manpower and budget from 2004 to 2019
Source / <http://www.jamstec.go.jp/e/about/sui/>

Table 1 / Principal specifications of JAMSTEC Research Vessels

Name	YOKOSUKA よこすか	KAIREI かいらい	MIRAI みらい	KAIMEI かimei	HAKUHO 白鳳丸	SHINSEI 新青丸
						
Completion	1990	1997	1997	2016	1989	2013
Length×Beam (m)	105×16	106×16	128×19	100.5×20.5	100×16	66×13
Gross tonnage (tons)	4,439	4,517	8,706	5,747	3,991	1,635
Speed (knots)	16	16	16	12	16	12
Accommodation (Researchers)	60(15)	60(22)	80(46)	65(38)	89(35)	41(15)
Major Mission Equipment	MBES/SBP ADCP Gravimeter Magnetometer Hydro acoustic navigation system XBT/XCTD	MBES/SBP MCS Gravimeter Magnetometer Winch system Hydro acoustic navigation system XBT/XCTD	MBES/SBP Water sampler ADCP Doppler radar Winch system Gravimeter Magnetometer Radiosonde Maritime meteorological observation system Hydroacoustic navigation system XBT/XCTD	MBES/PDR Gravimeter Magnetometer CTD system Water sampling XBT/XCTD Winch system. ADCP Transponder system Meteorological observation system Three-mode multi-channel seismic system 40 meter-long piston corer system BMS Power grab sampler 3,000 meter-class ROV Container laboratory Analytical and experimental equipment Anti-rolling system	PDR MBES/SBP Water sampler Winch system ADCP Gravimeter XBT/XCTD	MBES/SBP/PDR Gravimeter Magnetometer XBT/XCTD CTD system Water sampler Winch system Hydroacoustic navigation system Fish-finder Maritime meteorological observation system
Ship characteristics	Supporting SHINKAI 6500 & AUV URASHIMA	Supporting ROV KAIKOU 7000	Arctic Sea Observation and Buoy Deployment in	Geophysical Survey Ship	General-purpose R/V for academy research	General-purpose R/V for academy research
Sailing	Nippon Marine Enterprises, Ltd.				JAMSTEC	NME
Deck work	Nippon Marine Enterprises ∙ Marine Works Japan					

ADCP: Acoustic doppler current profiler. MBES: Multibeam echo sounder SCS: Single-channel seismic survey system
DPS: Dynamic positioning system SBP: Sub-bottom Profiler MCS: Multichannel seismic survey system

III. SHINKAI 6500

Deep submersibles research vehicle such as the Alvin, the Nautile, and the MIR I/II took a close look at the wreckage of the Titanic at 3,810 meters below the sea floor in the North Atlantic between 1986 and 1998, unveiling the mystery of the shipwreck and leading to the film Titanic.

There are about 13 manned deep submersibles in the world, mainly developed by the United States, France, Russia, Japan and China, to carry out Underwater investigation, seabed exploration, seabed development and salvage missions. Generally speaking, the design depth of deep submersibles for oil and gas exploration is within 4,000 meters, while those that can reach more than 5,000 meters are mostly built for scientific research purposes. In terms of dive depth, the current Japanese JAMSTEC SHINKAI 6500 dived to a depth of 6,527 meters in August 1989, placing it third. This record stood for nearly 23 years before it was surpassed by the Chinese submersible "Jiaolong". The dive record by SHINKAI 6500 shows that she made 1,529 trips between 1990 and 2018, in addition to exploratory missions to the seabed around Japan, she also traveled to the Mariana Trench, Mid-Atlantic Ridge, Southwest Indian Ridge, etc., covering all three oceans, providing important observations for understanding the Earth's internal movements, unraveling the evolutionary history of living organisms, deep-sea bioavailability conservation and interpreting the thermal cycle.

In response to the increasing competition in deep-sea exploration around the world, JAMSTEC announced the SHINKAI 12000 development plan in 2014, which is expected to regain the position of the most powerful deep submersible by 2023 and reach the deepest part of the sea.

IV. Research vessel operations

JAMSTEC operates not only the D/V ChiKyu, but also six other research vessels. The information of each vessel and its operation is summarized in Table 1. The research vessels are designed to support deep submersible support, oceanographic survey, submarine resource exploration, and marine scientific survey in the northeastern area of Japan, and support the marine research topics of JAMSTEC and the domestic marine research. The marine scientific survey service that supports the operation of the research vessel includes the professional marine navigation and survey technology. Except for R/V Hakuho Maru, which is operated by the crew received from the University of Tokyo, most of the research ships are entrusted by professional marine scientific research support cooperative companies to assist in the implementation.

With the exception of the R/V Hakuho Maru, which was manned by crews transferred from the University of Tokyo in 2014, most of the other research vessels were executed with the assistance of a professional marine research investigation support company.

Medium-term Objectives

JAMSTEC's current ongoing plan is a seven-year medium-term plan starting in April 2019. In addition to the Act on General Rules for Incorporated Administrative Agencies, Basic Plan for Science and Technology, the Abe administration's Society 5.0 plan for a "human-centered society," and the United Nations Sustainable Development Goals (SDGs), the plan integrates the idea of "oceans, earth, and life" and spreads scientific knowledge in the hope that human society can help the future of the planet.

JAMSTEC's current program development focuses on the promotion of basic research and development in marine science and technology and the establishment of a core institution for marine science and technology, which includes 1. understanding the current status of global environmental change and predicting the future; 2. understanding material circulation and origin of resources in oceans to ensure sustainable use; 3. Elucidating earthquakes and volcanic activity in marine water to aid disaster mitigation; 4. Probing unknown causal relationships hidden in Earth system; 5. Pioneering original research and technological development aimed at the future, and 6. the use of large-scale R&D infrastructure and data dissemination.

Concluding Remarks

JAMSTEC will soon be celebrating its 50th birthday. Over the past decades, JAMSTEC has continued to support research and development and data collection and analysis of marine surveys in Japan, pushing Japan's marine research to a world leading position. It also actively translates marine knowledge and information into popular science content to disseminate marine knowledge and technology to the public. During COVID-19, JAMSTEC is launching the "JAMSTEC for Students" online multimedia campaign to disseminate marine knowledge to Japanese children who are self-isolate at home. Marine research and development organizations such as JAMSTEC have not only accumulated a deep foundation in scientific exploration and academic research for Japan and humanity, but also provided the nourishment needed to build and realize dreams of "being close to the sea, knowing the sea, loving the sea and using the sea.

The National Research and Development Agency is committed to maintaining Japan's leading position in the world in basic science research, while at the same time actively promoting the integration of technology and research ideas across academic fields and national boundaries, accelerating open innovation with commercial value, and systematically addressing local or global issues of concern. For example, the Marine Radiological Survey USV released in 2019, which integrates JAMSTEC and the Japan Atomic Energy Research and Development Agency (JAEA) as well as the industries in the Hamadori region of Fukushima Prefecture, is quite worthy of reference as it develops and solves the important issue of marine monitoring after a nuclear disaster from multiple perspectives.

Finally, the link between JAMSTEC's research and the UN Sustainable Development Goals (<https://www.jamstec.go.jp/sdgs/e>), as drawn up by JAMSTEC, shows that it actively contributes to solving common problems of the international community by understanding how human behavior affects the Earth system through various research and development, by understanding the realities of the Earth as a diverse and complex system centered on the ocean and predicting its future.

Overview of Japan's Third Stage Basic Plan on Ocean Policy

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Translated by Linguitronics

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In 2007, Japan passed its Basic Act on Ocean Policy on the basis of international ocean law and established the Headquarters for Ocean Policy under its Cabinet Office, the purposes of the act and headquarters being to achieve Japan's national policy goal of becoming a maritime nation while working alongside other nations, in a peaceful and sustainable way, in the utilization of ocean resources, protection of ocean environments, and preservation of ocean safety. On the basis of the Basic Act on Ocean Policy, the Japanese Government has formulated a Basic Plan on Ocean Policy, and reviews and amends the Act every 5 years.

Japan's Headquarters for Ocean Policy developed the first stage of its Basic Plan on Ocean Policy in 2008, the second stage in 2013, and third in 2018.

An overview of the third Basic Plan on Ocean Policy, currently under way, is below (Cabinet Office, Basic Plan on Ocean Policy (stage 3), 2018. Retrieved from <https://reurl.cc/R4rYyz>, Apr. 1, 2020):

Plan framework

The plan consists of an introduction and three major sections. The introduction gives an overview of the 10 years since enactment of the Basic Act on Ocean Policy, as well as the current situation of the ocean. The first section, general remarks, picks up from the current situation acknowledged in the introduction to describe the prescribed ocean policy, including ocean policy concepts, goals, and basic ocean policy measures for the next 10 years. The second section establishes specific ocean policy implementation strategies for the next 5 years, including those that should be integrated and those that should be implemented in collaboration with related agencies. The third section notes matters for general and scheduled strategy execution.

Ocean policy concepts, goals, and basic ocean policy measures

Japan's Basic Act on Ocean Policy contains six basic concepts, namely harmonization of the development and use of the oceans with the conservation of marine environment, maintaining the safety and security of the oceans, improvement of scientific knowledge of the oceans, sound development of marine industries, comprehensive governance of the oceans, and international partnership with regard to the oceans. With the above mentioned concepts in mind, the Plan determines specific ocean policy goals as below, titled "The challenge of a new maritime nation."

- I. Toward open and stable seas. Protect the nation and its citizens.
- II. Apply the seas to help the nation prosper. Pass on the seas to posterity.
- III. Challenge unknown seas. Improve technology and enhance awareness of seas.
- IV. Take the lead to realize peace. Create international standards for seas.
- V. Familiarize people with seas. Develop human resources with knowledge of the ocean.

Plan policies and measures

The Plan lists approximately 370 policy items and measures, summarized as below:

I. Comprehensive maritime security

Securing national interests in Japan's territorial waters, securing stable use of Japan's important seas, and strengthening the international maritime order to ensure freedom of ocean use.

II. Promotion of marine industries

Promoting the development of ocean resources and energy resources; strengthening the international competitiveness of ocean industries; expanding ocean industry utilization; and ensuring the development of maritime transport, water resource management, and the aquatic product industry.

III. Maintaining and conserving marine environments

Ensuring ocean biodiversity, responding to climate change and ocean acidification, responding to marine litter, preventing marine pollution, monitoring radiation, and reconciling marine development and use with the environment.

IV. Improving scientific knowledge

Promoting marine science and technology research and development, maintaining and improving ocean surveys and observations, and supplementing and strengthening shared fundamental marine science and technology.

V. Promoting Arctic policy

Strengthening the Arctic research and observation system, promoting international collaborations for Arctic science and technology, training professionals to solve Arctic issues, actively participating in international regulation establishment, promoting cooperation between two or more countries, and actively participating and contributing in Arctic Challenge for Sustainability (ArCs).

VI. International collaboration and cooperation

Formulating and developing maritime order, international cooperation on the ocean.

VII. Developing human resources with ocean knowledge and advancing citizens' understanding of the ocean

Training and securing of specialist human resources to support the maritime nation, educating children and young people about the ocean, and advancing citizens' understanding of the ocean.

To promote and monitor the Plan's implementation, the Headquarters for Ocean Policy is collaborating with the Administration Office of the Headquarters for Ocean Policy to become a control center within the Japan government. The plan, do, check, and act (PDCA) quality control cycle shall be utilized to control and evaluate the operational process of each policy, pushing each policy forward comprehensively as scheduled, with engineering management indices employed for inspection. Also, the importance of responsibilities and cooperation between industry, government, and academic personnel shall be highlighted. Information shall be monitored for proper disclosure and transparency to assist in collaboration between different agencies.

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