國際海洋資訊

International Ocean Information

15
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雙月刊 | Bimonthly

氣候危機下的北極海洋研究

Arctic Ocean Research Within the Context of the Climate Emergency

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Aligning with International Standards and Enhancing Taiwan's Polar Research Capability

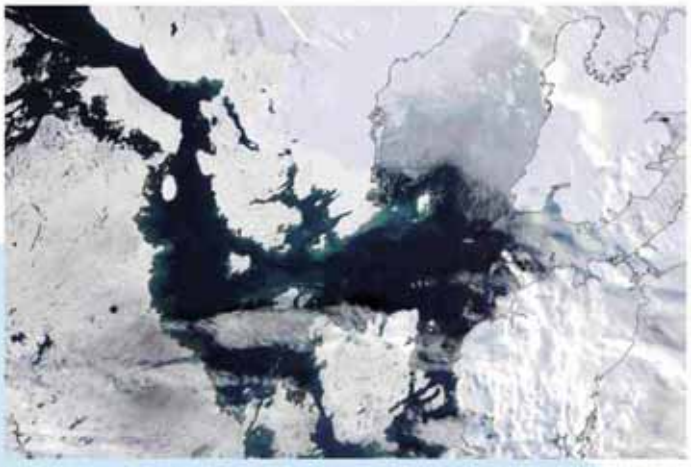
Translated by Linguitronics

Minister of the Ocean Affairs Council: Chung-Wei Lee

This issue introduces important ocean governance strategies in the United Kingdom, a maritime nation. Across aspects of organization, regulations and industry, the management of marine affairs in the UK is mainly based on the Marine and Coastal Access Act 2009, which established a comprehensive structure for marine management. The UK's Marine Management Organization (MMO) coordinates the cooperation of various ministries on marine management and development, and is responsible for the formulation and management of marine plans. Under the framework of "Marine Spatial Planning" (MSP), it provides maritime permit applications for offshore wind farm development, and also manages non-licensable beach recreational and water activities in Marine Protected Areas (MPAs). Taiwan can find a useful reference in the UK's proper protection and improvement of its marine environment, performed while carrying out sustainable marine activities and development.

The UK Overseas Territories span a massive area, from the tropics to the Antarctic circle. In order to enhance the MPAs of its overseas territories, it has rolled out the world's largest-scale marine conservation program: the Blue Belt Programme. The Programme implements management strategies such as ocean exploration, biodiversity protection, local MPA management, and sustainable fisheries in the 7 overseas territories; it also applies ocean monitoring technologies to implement management. However, the establishment of an MPA in the Chagos Archipelago in the central Indian Ocean in the British Indian Ocean Territory in 2010 involved fishing rights in Mauritius and the extension of the Maldives' coral reefs. The practices of the countries concerned and the decisions of the International Court of Justice are also worth reading.

Taiwan has taken a new step into Arctic research. In August 2021, the National Academy of Marine Research, the School of Earth Sciences of National Central University, and Nicolaus Copernicus University in Poland joined forces to conduct land observations and experiments at the Spitsbergen research station on Svalbard and collect Arctic Sea data for research. Research topics include land seismic wave measurement on ice sheets and surface drifters. This research has not only opened the doors to polar marine scientific research in Taiwan, but also looks forward in expectation of Taiwan increasing its polar marine research capability and gradually aligning with international standards!



In order to understand the impact of the global climate emergency on the Arctic Sea, large-scale, international polar region observation projects were carried out in cooperation with many countries.(The picture shows the unfrozen Arctic Sea in October 2021)
Source/ Arctic Lows, NASA Earth Observatory
https://earthobservatory.nasa.gov/images/148974/late-bloomers-in-the-arctic

Arctic Ocean Research Within the Context of the Climate Emergency

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Translated by Linguitronics
Keywords: Arctic, sea surface float, melting ice, sea surface temperature, climate emergency

With the global climate emergency resulting from human activities and CO_2 emissions, the United Nations Intergovernmental Panel on Climate Change (IPCC) pointed out in its "AR6 Climate Change 2021: The Physical Science Basis" [1] that it released in 2018 that the global mean warming between 2010 and 2019 is 1.07°C higher than the global mean warming from 1850 to 1900. Also, its special report "Global Warming of 1.5°C "in 2018 indicate that it is predicted that global mean warming will reach 1.5°C from 2030 to 2052 based on the current global warming rate [2], indicating that there is a gradual phenomenon of "global heating". Under the condition of global warming, the area covered by sea ice in the Arctic Circle is shrinking, and the rate of melting is accelerating. Polar region research [3] shows that the Earth lost 28 trillion tonnes of ice from 1994 to 2017, of which 58% occurred in the northern hemisphere, including about 7.6 trillion tonnes of sea ice in the Arctic, and about 3.8 trillion tonnes of ice cover in the Greenland ice sheet. Sea ice concentration data of the Arctic Ocean from satellite observations (Figure 1) show that the sea ice concentration in 2020 is about 7.28 million square kilometers, which is about 2.19 million square kilometers smaller than that in 2000. The melting of the Arctic ice and glaciers has also intensified the trend of rising global sea levels [4], which is about 1.8mm per year. However, the melting of Arctic sea ice not only impacts the land, atmosphere, ocean, ecology, and local ethnic activities of the polar regions, but also affects global natural resources and economic and military strategies, such as the rich reserves of oil and gas and the exploitation and opening of new trade routes.

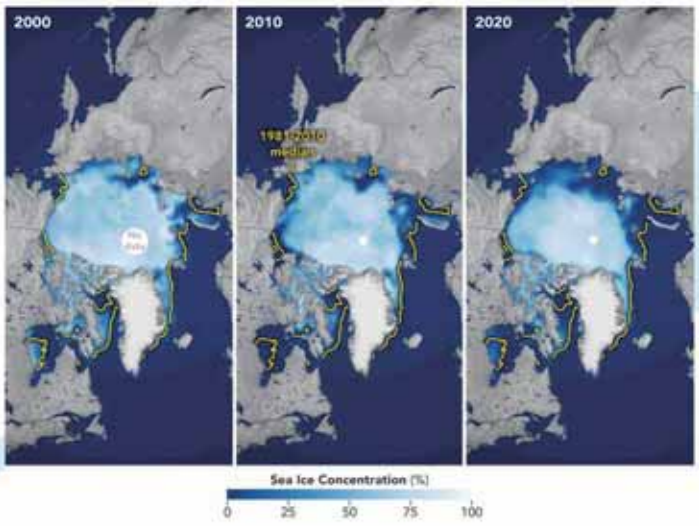

Figure 1/ From left to right, the changing trends of Arctic polar sea ice density in July 2000, July 2010, and July 2020
Source/ Arctic Lows, NASA Earth Observatory

The Impact of the Global Climate Emergency on the Arctic Ocean

In 2019, the IPCC released the "Special Report on the Ocean and Cryosphere in a Changing Climate" [5], in which it emphasized that the global climate emergency will have a massive impact on the ocean and polar regions. The report also raises current ocean observation, the impact of climate change on permafrost, and model simulation results and risks, as well as other trends; and how to take actions to protect the ocean and mitigate the climate emergency. Using the current level of greenhouse gas (GHG) emissions, the model estimates that ocean temperatures will continue to increase. Compared with the levels from 2006 to 2015, the dissolved oxygen in the ocean has decreased by 3% to 4%, and the pH value has decreased by 0.3. However, the warming of the ocean will lead to mass mortality by hypoxia (the reduction of dissolved oxygen) and ocean acidification cause the difficulty of the coral reef system to calcify in water with a low concentration of calcium carbonate, resulting in lower skeletal density and higher fragility and damage. However, when global warming is limited to 1.5°C, almost all warm-water corals will suffer widespread loss and local extinction. The polar regions will also be impacted. Its permafrost is rich in organic carbon, at about 1.7 trillion tonnes [6], which is equivalent to twice the atmospheric carbon content. Therefore, when the climate warms, these permafrost layers will release the carbon into the atmosphere, thus increasing the atmospheric carbon content. The melting of sea ice and the reduction in ice coverage have greatly impacted the activities of the indigenous peoples in the polar regions, with the scope of their activities in decline and their ecosystem habitats shrinking. In August 2021, Greenland in the Arctic Circle was affected by abnormal climate, with a rainfall that was the largest since 1950. These warning signs indicate that the rate of melting in the Arctic has accelerated. In the future, if there is large-scale melting of ice, sea levels may gradually rise, which will increase the risk of seawater intrusion into the low-lying coastal areas of Taiwan.

In order to understand the impact of the global climate emergency on the Arctic Ocean, large-scale, international arctic observation projects have been conducted. The 2019 Multidisciplinary Drifting Observatory for the Study of Arctic Climate (MOSAiC) project was an historic international research expedition of Arctic ice. The team drifted through the Arctic Ocean on the German icebreaker Polarstar for marine scientific surveys over a one-year period, collecting precious information on the atmosphere, oceans, sea ice, and ecosystems. It is hoped that in the future, the survey can help understand the Arctic ocean environmental changes and provide a basis for the construction and prediction of numerical ocean models to help assess the impact of climate change on the Arctic Ocean as well as on the world. Assistant Professor from National Sun Yat-sen University, Dr. Ying-Chih Fang, who was the only Taiwanese scientist to participate in the 2019 MOSAiC cruise. He pointed out another international joint observation and research project of the Arctic is "The Synoptic Arctic Survey (SAS): A Developing Multi-Nation Interdisciplinary Survey of the Arctic Ocean". This project is a joint multi-national project (the US, Canada, Sweden, Japan, Republic of Korea, Germany, Norway, Russia, Denmark, China). The research teams of the participating countries will apply for icebreaker voyage plans from 2022 to 2023 to make synoptic observations of different areas of the Arctic (Figure 2). Its purpose is to conduct a complete detection of the biochemical and physical parameters of the large Arctic Ocean and record its current state. It will be unlike previous research conducted by a small number of teams in small areas. The collected data will be compared with historical data collected over the past 40 years to estimate the changes from climate change in the Arctic Ocean. Key scientific issues are: I. Changes in physical mechanisms; II. Migration and invasion of non-Arctic marine species; III. Changes in the current state of the local carbon cycle.

Figure 2/ Planned route for joint observation voyages in the Arctic Ocean (white line)
Source/ https://synopticarcticsurvey.w.uib.no/

International Cooperation on Ocean Observation in the Arctic Ocean

The first Arctic research project in which Taiwan institutions were involved was in August 2021; it was conducted jointly by the National Academy of Marine Research (NAMR), the School of Earth Sciences of National Central University (NCU), and Nicolaus Copernicus University in Poland. The first Arctic Circle research was conducted in Svalbard (Figure 3); land observation station experiments were conducted on the research station on Spitsbergen and Arctic Ocean data collection was performed for research. Research topics include land seismic wave measurement on ice sheets and surface drifters.

The geological research team from NCU pointed out that they could often hear the huge sound of glaciers collapsing during field work. Therefore, a seismograph was placed to observe the ice shock caused by glacier collapse [7]. Previous study [8] has confirmed that the seismograph signal recorded on Spitsbergen Island manifested like the vibrations experienced when an earthquake occurs; a camera was used to simultaneously capture the state of the ice shock (Figure 4). The NAMR and NCU planned to jointly launch surface drifters developed by NCU (Figure 5). The drifters observe changes in ocean currents, wave characteristics, and sea surface temperature, to investigate the phenomenon of rapid ice melting in the Arctic Ocean. On the bottom of the drifter is a temperature sensor, which can measure sea surface temperature. The internal PCB design allows it to detect the drift speed and wave height. There are also two square-shaped satellite transmission and GPS positioning antennas for periodic data transmission and estimation of the currents derived from the trajectory. Professor Hwa Chien of NCU pointed out that in recent years, satellite observations of ice coverage on the Arctic Ocean have found that the sea ice is disappearing much faster and more severely than all previous ocean models have predicted. Research has postulated that the reason for this is likely related to climate change in the Arctic Ocean and the resulting positive feedback mechanism. Figure 6 shows the drifters deployed on the west shore of Svalbard, located in the Fram Strait (one of the waterways for the exchange of water between the Arctic Ocean and the North Atlantic Ocean) in the north Greenland Sea.

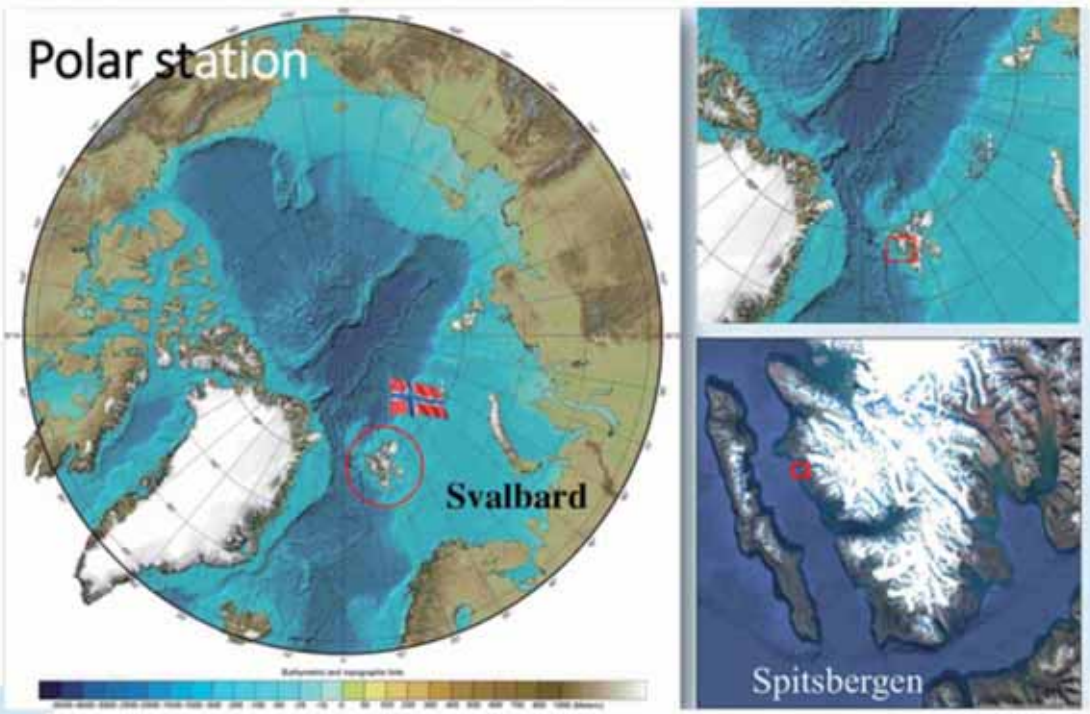

Figure 3/ Geographical location of Svalbard in the Arctic Ocean
Image by National Central University

Beginning in August 28, 2021, the surface drifters have sent data back in real-time through satellite communications. The real-time observation information can be obtained at the NAMR, and observation information such as sea surface temperature and current and wave conditions can be obtained along the drift path. Preliminary observation results show that the surface temperature of the sea water along Svalbard is about 7 to 7.5°C, which is 2 to 4°C warmer than that of the Fram Strait. This shows a warming trend when compared with the average temperature of 6.75 to 6.9°C on the sea surface observed by satellites in August 2020. The current speed is still moderate; the drifters flow northward at about 0.2 to 0.6 m/s. Some of the drifters floated northward into the Arctic Ocean along the West Spitsbergen Current (a branch of the warm North Atlantic Current). A small number of drifters drifted westward due to the countercurrent of the Atlantic Ocean, which is similar to the path (Figure 7) of the countercurrent of the Atlantic Ocean in this area from past research [9]. There are sea surface wave conditions of about 1.5 to 3 meters, which are harsh sea conditions. The team of Professor Hwa Chien from NCU have proposed: The breaking of sea ice by waves will accelerate melting; in addition, the sea ice itself will continue to propagate the energy of the waves and cause more extensive damage. In addition, the reduction of sea ice means that the area of the sea will increase, wave heights and wavelengths will become larger, and the generation of sea ice will be reduced.

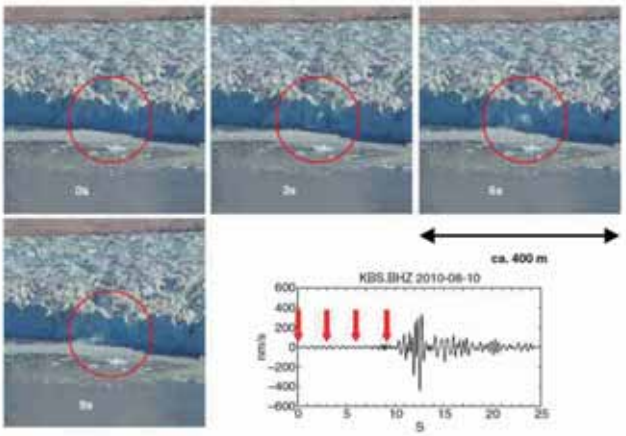

Figure 4/ As ice shocks are captured by the camera, the seismograph signal manifests like the vibrations experienced when an earthquake occurs

Source/ [8]

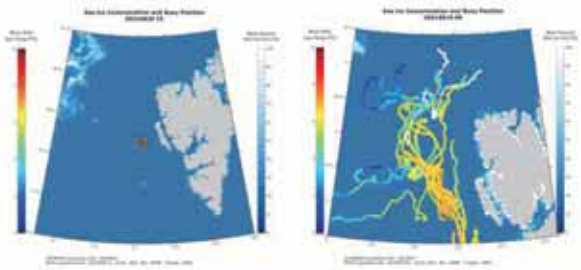

Figure 6/ The trajectory of the surface drifters and the sea surface temperature observation results (background color is the sea ice concentration from satellite observation): (Left) Original deployment position; (Right) Drift trajectory of the sea-surface micro buoys after 21 days

Images by Team of Professor Hwa Chien from National Central University

Figure 5/ Preparing to deploy the surface drifters and the float state after deployment

Images by Team of Professor Hwa Chien from National Central University

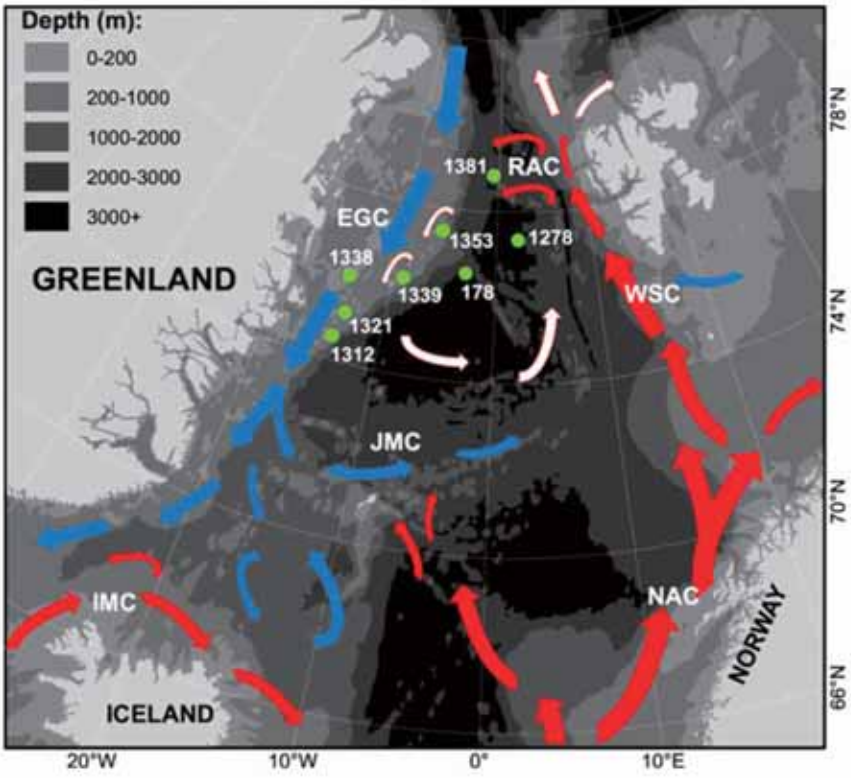

Figure 7/ A distribution map of currents around Greenland and Svalbard. The red arrows are the Norwegian Atlantic Current (NAC), the Irminger Current (IMC), the West Spitsbergen Current (WSC), and the Return Atlantic Current (RAC); the white arrows are the Atlantic subsurface water; the blue arrows are the Arctic surface current: East Greenland Current (EGC), and Jan Mayen Current (JMC)
Source/ [9]

Future Prospects

At present, there are very few Taiwanese marine researchers and scientists engaged in the polar regions. The NAMR hopes to use the international cooperation with NCU and Nicolaus Copernicus University in Poland as a starting point for monitoring the Arctic marine environment and collecting basic hydrological data from the polar regions. Through such work, it will guide and improve Taiwanese polar marine scientific research, and provide subsequent research results to the government for research on polar marine policies and the development of the polar region blue economy. At this stage, in addition to the polar international cooperation with Poland, there are future plans to cooperate with top polar research units, such as the Woods Hole Oceanographic Institution and the University of Alaska Fairbanks in the United States and Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung in German, with a view to gradually align Taiwan's polar marine research capability with that of the international community.

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Analysis of Dispute Concerning Delimitation of the Maritime Boundary in the British Indian Ocean Territory

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Keywords: Mauritius, the Maldives, the Chagos Archipelago, Maritime Dispute

The International Court of Justice (hereinafter "the ICJ") cannot exercise its jurisdiction in contentious proceedings without the consent of the States concerned, but Professor Peter Malanczuk indicates that the 1982 Law of the Sea Convention (hereinafter "UNCLOS") automatically makes each ratifying state at the same time party to the dispute settlement provisions [1]. Furthermore, the formulation of UNCLOS Part XV makes the Arbitral Tribunal a default forum for compulsory dispute settlement. As of 2021, six applications have been filed to the Arbitral Tribunal for prescribing provisional measures, and twelves for adjudication. On the other hand, just as the present case, any application can be transferred to any one of the forums if the parties to the dispute so agree. As of 2021, six applications have been transferred to the International Tribunal for the Law of the Sea (hereinafter "the ITLOS") [2].

The Origin of Dispute - the Chagos Archipelago

Mauritius had been one of the French colonies until it was ceded to the United Kingdom in 1814. In 1965, The United Kingdom had separated the Chagos Archipelago (hereinafter "the Archipelago") from Mauritius to form the British Indian Ocean Territory (BIOT) before Mauritius gained independence in 1968. The United Kingdom continues its sovereignty claims over the Archipelago and undertakes to return it to Mauritius when the Archipelago is no longer needed for defence purposes. On 1 April 2010, the United Kingdom unilaterally announced the creation of a Marine Protected Area (hereinafter "the MPA") in and around the Archipelago, which violated its obligation to ensure the fishing rights of Mauritius. On the other hand, on 26 July 2010, the Maldives made a submission regarding the extended continental shelf to the Commission on the Limits of the Continental Shelf (hereinafter "the CLCS"). As the distance between the Archipelago and the Maldives is less than 400 nautical miles (517 kilometers, about 279 nautical miles) [3], there is a potential overlap area between the maritime zones of the two Parties (Figure 1). But the Maldives refused to negotiate the issue with Mauritius. Consequently, Mauritius, confronted with two disputes, chose to institute arbitral proceedings against the United Kingdom on 20 December 2010 and against the Maldives on 18 June 2019, respectively.

On 15 March 2015, the Arbitral Tribunal rendered its award, in the Arbitration Regarding the Chagos Marine Protected Area between Mauritius and the United Kingdom of Great Britain and Northern Ireland, that the United Kingdom's purported "MPA" was incompatible with article 2(3), article 56(2) and article 194(4) of UNCLOS [4]. As to the disputed sovereignty over the Archipelago, the United Nations General Assembly (hereinafter "the UNGA"), on 22 June 2017, requested the ICJ to give an advisory opinion. On 25 February 2019, the ICJ delivered its advisory opinion on the Legal Consequences of the Separation of the Chagos Archipelago from Mauritius in 1965 as follows [5]:

I. The process of decolonization of Mauritius was not lawfully completed when that country acceded to independence, following the separation of the Archipelago;

II. The Archipelago is an integral part of Mauritius. The United Kingdom's continued administration is an unlawful act of a continuing character, and must be brought to an end as rapidly as possible;

III. All Member States are under an obligation to cooperate with the United Nations (hereinafter "UN") to complete the decolonization of Mauritius.

In resolution 73/295 adopted on 22 May 2019, the UNGA demanded that the United Kingdom withdraw its colonial administration from the Archipelago and complete the decolonization of Mauritius within a period of no more than six months from the adoption of the present resolution, and called upon all Member States to cooperate with the UN to ensure the completion of decolonization of Mauritius as rapidly as possible. But the Maldives and the United Kingdom voted against it [6].

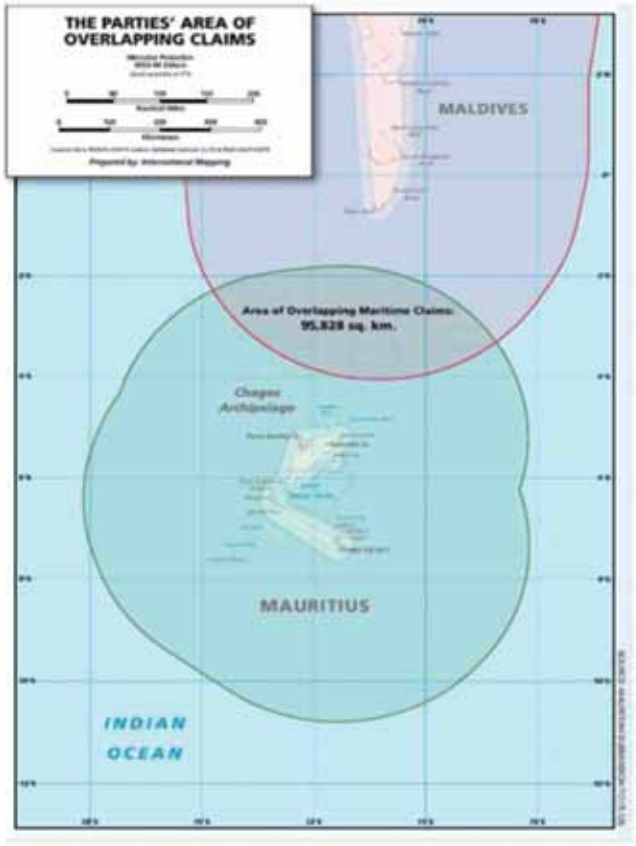

Figure 1/ International institute for Law of the Sea Studies (Dec. 7, 2019), Dispute concerning delimitation of the maritime boundary between Mauritius and Maldives in the Indian Ocean (Mauritius / Maldives)
Source/ [7]

Exchange of Views between the Two Parties

Before submitting the notification of instituting arbitral proceedings against the Maldives, Mauritius has tried to negotiate with the Maldives, but the Maldives was volatile. In respect to the Maldives' submission to the CLCS, Mauritius attended their first meeting in Malé, the capital of the Maldives. The Maldives agreed that the exclusive economic zone coordinates of Mauritius in the Chagos region were not taken into consideration and that this would be recitified by an addendum to the submission in question [8]. During a State visit to Mauritius, in a Joint Communiqué was issued on 12 March 2011, the Maldives agreed to make bilateral arrangements on the overlapping area of extended continental shelf around the Archipelago. However, no addendum had been filed to the submission. In a diplomatic dated 24 March 2011, addressed to the Secretary-General of the United Nations, Mauritius protested against that the extended continental shelf being claimed by the Maldives encroached on the Exclusive Economic Zone of Mauritius.

Following the ICJ's advisory opinion in 2019, in a diplomatic note dated 7 March, Mauritius invited the Maldives to a second round of discussion in April, but the latter did not respond to the former. Consequently, Mauritius informed the Maldives of instituting arbitral proceedings on 18 June. Nonetheless, the Parties, pursuant to article 15(2) of Annex VI to UNCLOS, reached an agreement on the transfer of the dispute concerning the delimitation of their maritime boundary in the Indian Ocean to a Special Chamber of the ITLOS (hereinafter "the Chamber"). The President of the ITLOS invited the Parties to consult on matters relating to proceedings, including the Maldives's right to submit its preliminary objections.

The Maldives' Preliminary Objections

On 18 December 2019, the Maldives raised five preliminary objections to the jurisdiction of the Chamber and the admissibility of Mauritius' claims as follows:

Table 1/ The Maldives' Five Preliminary Objections and the Special Chamber's Decisions

Objections	Contents	Decisions
First	The United Kingdom is an indispensable third party to the present proceedings.	Unanimously Rejects
Second	The Chamber has no jurisdiction to determine the disputed issue of sovereignty over the Archipelago.	Rejects By 8 votes to 1
Third	As the Parties have not engaged in the negotiations required by articles 74 and 83 of UNCLOS, the Chamber lacks jurisdiction.	Rejects By 8 votes to 1
Fourth	As there is no maritime boundary dispute between the Parties, the Chamber has no jurisdiction.	Unanimously Rejects
Fifth	Mauritius' claims constitute an abuse of process.	Unanimously Rejects

Source/ [9]

The Maldives contends in its first preliminary objection that, until the resolution of the sovereignty dispute, the United Kingdom is entitled to exercise the rights of a coastal State under UNCLOS. As the United Kingdom is absent in these proceedings and does not consent to be a party to them, under the Monetary Gold principle, the Chamber has no jurisdiction.

In its second preliminary objection, the Maldives contends that, if the Chamber were to determine Mauritius' claims, it would necessarily determine the disputed issue of sovereignty over the Archipelago. But the Chamber has no such jurisdiction over sovereignty disputes, but over disputes concerning the interpretation or application of UNCLOS, pursuant to article 288(1) of UNCLOS. Even if the ICJ determines the United Kingdom bears an obligation to complete the process of decolonization, such an obligation is not necessarily accompanied by an instant loss of sovereignty.

In its third preliminary objection, the Maldives argues that, pursuant to Article 74 and 83 of UNCLOS, only such negotiation between the Parties has been engaged in and the attempt to reach an agreement has been failed that either State can resort to the procedures provided for in Part XV of UNCLOS. However, as this precondition has not been fulfilled in the present case, the Chamber has no jurisdiction.

In its fourth objection, the Maldives states that Mauritius has not pointed to any dispute or positive opposition between the Parties regarding their respective maritime boundary claims and the agreement on the transfer of the dispute to the Chamber does not establish the existence of a dispute.

Based on these four objections, Mauritius' claims constitute an abuse of process.

Mauritius' Contentions

Mauritius requests the Chamber to rule and adjudicate as follows:

I. The Preliminary Objections raised by Maldives are rejected;

II. The Chamber has jurisdiction to entertain the Application filed by Mauritius;

III. There is no bar to the Chamber's exercise of that jurisdiction;

IV. The Chamber shall proceed to delimit the maritime boundary between Mauritius and the Maldives.

Mauritius contends that the issue of whether the Archipelago forms an integral part of Mauritius was inseparable from the issue of the lawfulness of Mauritius' decolonization. Once the ICJ decides whether the decolonization of Mauritius had been lawfully completed, it also inevitably determines which State was the lawful sovereign over the Archipelago. As the wrongful detachment from Mauritius would transgress the general principle of international law of ex injuria non oritur jus, the United Kingdom has no lawful basis to claim sovereignty over the Archipelagos. Under UNCLOS, Mauritius is the coastal State to the Maldives in respect of the Archipelago for the purpose of the delimitation of a maritime boundary.

During the eight years from 2011 to 2019, the Maldives has failed to abide by the promises and has violated its obligation as provided in Article 74 and 83 of UNCLOS. It also failed to abide by the UNGA resolution 73/295, where all Member States have an obligation to cooperate with the UN to ensure the completion of decolonization of Mauritius. The Maldives cannot refuse to negotiate with Mauritius only by invoking the United Kingdom's unlawful claims over the Archipelago. Furthermore, a dispute has existed between the Parties before instituting the arbitral proceedings, and the meeting was convened expressly to discuss a potential overlap of the extended continent shelf and to exchange views on maritime boundary delimitation between the Parties.

The Decisions of the Special Chamber

The Chamber rejected all of the five preliminary objections presented by the Maldives (Table 1). First, the Chamber notes that Mauritius' claims are based on the premise that it is the coastal State of the Archipelago, but as to which the Maldives hold a markedly different view.

Accordingly, the Chamber should entertain the first and second preliminary objection together: once the question of the legal status of the Archipelago is resolved, so is the question of whether the United Kingdom is an indispensable third part. The Chamber agrees that UNGA has not sought the ICJ's opinion to resolve a territorial dispute over the Archipelago, but it cannot be referred that there is no relevance or implication for the issue of sovereignty [10]. The Chamber considers that the Archipelago's wrongful detachment by the United Kingdom constitutes its unlawful administration of the Archipelago. The United Kingdom cannot have any legal interests in disposing of maritime zones around the Archipelago [11]. Mauritius can be regarded as the coastal State in respect of the Archipelago even before the process of the decolonization is completed [12].

The Chamber rejected the third and the fourth objections because Mauritius has attempted to engage the Maldives in negotiation while the Maldives at times had shown interest in meeting and had met

with Mauritius to exchange views on maritime boundary delimitation between the two Parties. However, the Maldives insists that the jurisdiction over the Archipelago is not exercised by the Mauritius and refuses to engage any negotiation. The Chamber considers that the obligation under article 74 and article 83 of UNCLOS, if no agreement can be reached within a reasonable period of time, the States concerned shall resort to the procedures provided for in Part XV, has been fulfilled. Accordingly, the Chamber rejects all the preliminary objections by the Maldives.

Conclusion

As the ICJ states, respect for the right to self-determination is an obligation erga omnes, all States have a legal interest in protecting that right [13]. The present case shows decolonization and territorial sovereignty are closely interrelated. It was not possible to talk of an international agreement on territory cessation when the United Kingdom was the authority of the Mauritius, which means no inter-state relations existed then. The detachment was not based on the free and genuine expression of the will of the people on the non-self-governance territory. Such a wrongful detachment of the Archipelago, which results into the incomplete decolonization of Mauritius, constitutes the United Kingdom's continued administration an unlawful act of a continuing character. Transgressing the general principle of international law of ex injuria non oritur jus, the United Kingdom' continued claim over the Archipelago still cannot constitute a lawful claim.

ICJ's advisory opinion is not binding but has legal effect [14]. The United Kingdom's refusal to comply with the UNGA resolution to withdraw the colonial administration shows that the international community does not possess any power to take enforcement measures or sanctions against the Strong Power refusing to comply with the international law.

The present case also shows the arbitral proceedings as a default forum is increasingly important in the future. Once any party to the dispute submits the dispute to the arbitral proceedings, the other party is recommended to exchange views regarding their choice of procedure and to submit the preliminary objections to defense itself.

Note: Besides the present case, there are five more cases: the M/V "SAIGA" Case, Case Concerning the Conservation and Sustainable Exploitation of Swordfish Stocks in the South-Eastern Pacific Ocean, Dispute concerning delimitation of the maritime boundary between Bangladesh and Myanmar in the Bay of Bengal, The M/V "Virginia G" Case, and Dispute concerning delimitation of the maritime boundary between Ghana and Côte d'Ivoire in the Atlantic Ocean.

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Strategic Planning for the Long-Term Offshore Wind Power Industry in the UK

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Translated by Linguitronics
Keywords: Offshore wind power, net zero emissions

Offshore wind power has long since become a key energy source for the UK to achieve its 2050 net zero emissions goal. This article discusses the long-term planning for offshore wind power in the UK, which may serve as a reference for the promotion of the offshore wind power policy in Taiwan. This article mainly refers to the offshore wind power planning report made in cooperation from the Offshore Wind Industry Council (OWIC), which was formed by the UK government and the wind power industry, and ORE Catapult [1] .

The International Energy Agency's latest report - World Energy Outlook 2021 [2] pointed out that although new energy economies, such as solar and wind energy and electric vehicles, have flourished in certain countries, their progress is still far from sufficient to reduce global carbon emissions to the net zero emissions target by 2050. In the past two years, global economic development has been profoundly affected by the COVID-19 pandemic. However, renewable energy such as wind power and solar power have benefited from the loosening of economic policies and innovation in technology, and have grown rapidly in many countries.

In 2020, the installed capacity of world wind power reached a record high of 93GW. However, on the road to net zero emissions, the current growth rate still lags far behind. By 2050, wind power will account for about 43% of global energy mix. If net zero emissions is to be achieved, the annual growth rate of global wind power generation equipment would need to be fourfold over the next decade. Only then would the world be able to deploy scales of 380GW of offshore wind power by 2030 and 2,000GW by 2050.

The United Kingdom is one of the few countries that have included the pledge for net zero GHG emissions by 2050 into its Climate Change Act. Data show that since 1990, the UK's GHG emissions have dropped by 43.5%, mainly due to the extensive use of renewable energy sources such as wind and solar energy to replace coal-fired power generation. Compared to solar power, wind power is more susceptible to the impact of the terrain. However, due to the continuous improvements made in technology, offshore wind power has become the focus of global renewable energy development. The installed capacity of renewable energies in the UK surpassed that generated by fossil fuels for the first time in 2019, and of those renewables, the contribution of wind power is indisputable. In particular, there are many large offshore wind farms in the north that have been connected to the grid.

About 44% of the UK's electricity came from renewable energy sources in 2020. It is estimated that it will have 40GW (40 gigawatts) of wind power capacity by 2030. Offshore wind power has long since become a key energy source for the UK to achieve its 2050 net zero emissions goal. This article discusses different offshore wind power planning reports from the long-term offshore wind power plan made in cooperation from the OWIC and ORE Catapult, which looks to achieve the net zero

emissions target by 2050. The following summarizes the key points of the plan, which may serve as a reference for the promotion of the offshore wind power policy in Taiwan.

Planning model and scenario design

The offshore wind power potential of British waters is between 600GW and 1,000GW. Therefore, the report plans an offshore wind power installation by 2050 of between 50GW and 70GW. There are two main plan models. One of the models is ESME (Energy System Modelling Environment), which is used to evaluate the political and economic impact of offshore wind power and the optimal configuration of energy costs. The other model is SFM (Storage and Flexibility Model), which simulates uncertain risk factors for long- and short-term energy system operation. Under the influence of the 2050 net zero emissions target, there are two scenarios for this study: One is Further Ambition (FA), and the other is Alternative Net Zero (ANZ). ANZ contains 'speculative' non-energy related measures, such as changes in eating habits or reduction in carbon emissions from aviation. This scenario will achieve zero carbon emissions in 2050, while also putting relatively little pressure on the energy system. In contrast, FA puts greater pressure on the energy system. The core of the scenario is to increase offshore wind power, but there is no need to adopt additional carbon reduction measures. Therefore, under this scenario, carbon emissions will still be 4% in 2050 (Figure 1).

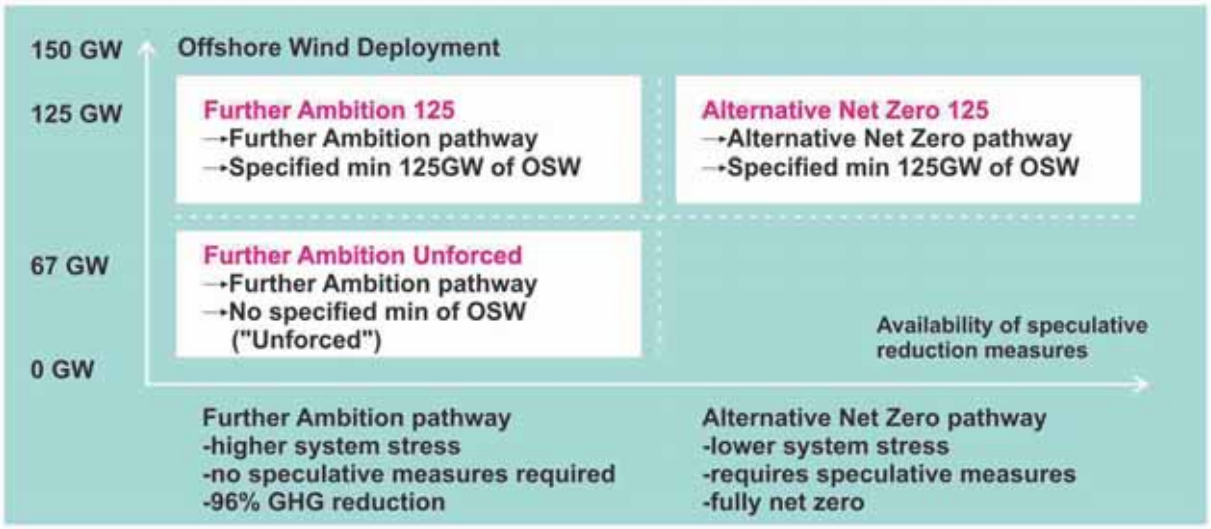

Figure 1/ Planned amounts of offshore wind power by 2050 under each scenario
Source/ [1]

Energy structure in the UK by 2050

Compared with the current 10GW of installed capacity of offshore wind power, the growth by 2050 to an installed capacity of 50-70GW will be stunning. Of course, in this scenario, the cost of the total energy system is relatively high, but it can achieve the policy goal of energy transition in the UK. From Figure 2, it can be seen in the 125GW (ANZ) scenario, the demand for offshore wind power is as high as 93GW during winter nights, when the wind is sufficient. But when the wind is relatively insufficient, the peak power demand is still as high as 91GW. During times of insufficiency, the gap needs to be filled by combined-cycle gas turbine and carbon capture and storage (CCGT+CCS) with 99% carbon capture capacity and hydrogen generators. To arrive at a low-carbon era and achieve an economically efficient energy structure, the following important factors should be paid attention to:

I. Energy diversification: The combination of other renewable energies (solar) and nuclear power generation should be considered as a response to the low air volume characteristics of wind power during specific periods.

II. Clean thermal power plants: CCGT+CCS and hydrogen generators are indispensable energy sources for power dispatch.

III. Nuclear energy: The deployment of nuclear energy also plays an important role in long-term plans, mainly due to nuclear energy's characteristics of low carbon emissions and low power generation costs. However, after the large-scale installation of offshore wind power, the demand for nuclear energy has dropped significantly (from 37GW to 8GW), which may impair the optimal scale (cost) of the nuclear power that was originally planned.

IV. Hydrogen energy is everywhere: In the future, CCGT+CCS will be mainly used to support peak electricity demand, and hydrogen energy will be used for immediate energy demand, including industrial, transportation, and heating. It is estimated that the demand for hydrogen energy will be as high as 200TWh by 2050.

V. Transportation and heating: The demand for transportation and heating does not change much between different scenarios.

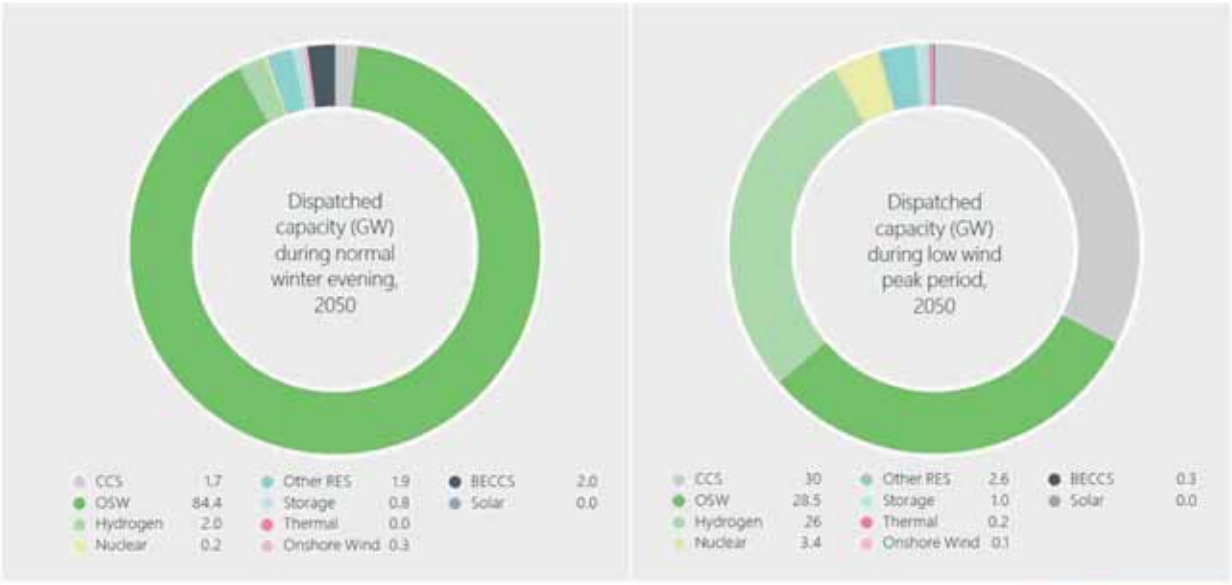

Figure 2/ OSW is typically the largest source of electricity generation in the UK (ANZ 125 scenario), with back up plant supporting in rare periods of low wind availability

Source/ [1]

Energy storage and power supply flexibility

How will the future energy system provide energy that is both cost-effective and reliable? The key lies in energy storage technology. Reserve energy capacity is made in response to the intermittent power generation characteristics of renewable energy. Affected by the significant increase in offshore wind power and the decline in nuclear power, the main energy sources for reserve capacity by 2050 will be hydrogen generators and CCGT+CCS. For example, in the 125GW (FA) scenario, 100GW of thermal power plants and 18GW of energy storage equipment are required to support a small number of specific energy demand peak times. When a large number of offshore wind power systems are used, demand-side management can also be used to reduce demand for standby power plants and thereby reduce

power generation costs. For example, heating storage technology for buildings (regional) and electric vehicle charging management are also possible methods (not charging during peak time of power demand). If the technologies or policy measures discussed above are implement appropriately, 30% of offshore wind power generation (100–190TWh) can be reduced, with a reduction in the corresponding investment costs for standby power plants.

Energy technology system considerations

Power system operations, related services, and power transmission infrastructure will also influence the installed scale of offshore wind power, and power systems will require combinations of multiple technologies. The impact of offshore wind power on the power system is mainly focused on two aspects: One problem is grid congestion. Transmitting a large amount of electricity from ocean to shore requires large-scale investment in grid facilities. The second problem is lack of traditional power backup. Power systems with excessive proportions of renewable energy (wind) power generation are prone to instability. These two problems can be solved by the smart grid, which is shown in Table 1.

Table 1/ Power transmission issues and solutions related to offshore wind power

Offshore transmission	→ East coast bootstraps will be effective. → Interconnection has a lot to offer - operability and synergies with markets with different characteristics. → Offshore grid could be even more effective - directly selling wind to where it's valued highest.
Smart grid solutions	→ A range of technologies already exists - the obstacle is finding the right governance arrangements to apply them, and comparing them fairly against conventional system services. → Operational paradigms - a grid made of many cells that self control, for example, may provide more reliability but less economy of scale.
Wind farms and ancillary services	→ With innovative control applications, wind farms could potentially contribute - but may not always be most economic solution. → OSW industry can support the System Operator in design of products and services.

Source/ [1]

Offshore wind power industry issues

Offshore wind power in the UK is estimated to have an installed capacity exceeding 40GW by 2030. Planning corresponding industry policies and management regulations will be the cornerstone of improving the offshore wind power industry. However, in the current market environment, large-scale offshore wind power generation will cause the wholesale electricity price to fall during periods of low power demand and reduce the revenue of the industry as a consequence. This issue will have a greater impact when the long-term plan gradually increases installed offshore wind power. On the road to net zero emissions, it is necessary to properly plan for the offshore wind power market to rectify the imbalance between power supply and demand. Important measures include grid-associated ancillary equipment and power market operation models. In order to achieve net zero emissions under the planned future energy market structure, a review of electricity market reform is necessary. It is necessary, especially in the short term, to thoroughly investigate the current power market model, including the electricity auction system, increasing the demand response to the power system, flexibility of power storage, establishing exit mechanisms for poorly operated power plants, innovative policy planning, reviewing non-regulatory government intervention measures, establishment of a carbon trading market, and establishment of a grid charging system that is fair and reflective of costs.

The need for innovation

Offshore wind power plays an important role in the UK's policy for net zero emissions by 2050. Therefore, it is necessary to formulate innovative policies, regardless of whether it is the energy industry or other areas. Integrating a large amount of offshore wind power is a very important part of innovation in technology, organization, market, policy, and regulations (Table 2). For example, the offshore wind power supply can be stabilized through policies for effective management of smart grids. At the same time, adopting a comprehensive minimum-cost optimal management policy (demand-side management) can effectively reduce offshore wind power generation (by 30%) and mitigate the impact from reduced revenue (electricity prices) resulting from a large number of units installed. Net zero emissions policy is an important vision and motivation for full offshore wind power generation. Improving the wholesale price of electricity is also an indispensable economic instrument.

Table 2/ The key to success and innovative approaches to offshore wind power

Electricity system operability support	→ Novel implementation of existing solutions (e.g. new ways of operating the power system, synchronous compensators, storage operating as part of local smart grids) → Grid-supporting capabilities of wind farms and their connecting networks (e.g. inertia, fast response, voltage support, fault current, black start, etc).
Power generation	→ Hydrogen turbines' flexible capabilities for evolving duty cycles (e.g. operability support, fast start). → Carbon capture and storage improvements to capture rates under all operating conditions (e.g. with low carbon content and whilst ramping). → Nuclear designs with greater load-following flexibility and/or ability to produce hydrogen.
Electrical and heat demand	→ Electrolysis cost reductions, improvement of operability characteristics and ability to site in difficult offshore environments. → Unit cost reductions of electrical storage (batteries and thermo-mechanical). → Increased energy density of domestic thermal storage, and cost-effective ability to interact with heat networks. → Interoperability of electric vehicle smart charging systems, and offerings to support uptake.
New hydrogen systems	→ Rules and standards for safe devices. → Incentivisation of hydrogen appliance uptake.
Power and gas interconnection	→ Hydrogen transmission and distribution network designs (e.g. potential for cost-effective hydrogen network to displace need for OSW farm power grid connection). → Cost reductions in design, infrastructure, and operational costs of offshore power networks.
Market innovation	→ CfD design to gradually incentivise OSW to deliver a wider range of capabilities in support of grid operation → Innovative market designs to create the impetus for demand flexibility to be fully realised. → Future energy market framework that unleashes innovation and provides a highly competitive environment, with clearly defined market outcomes for participants.
Policy innovation	→ Diversity in private financing of OSW and flexibility solutions through innovative policies, tools and instruments to reduce risks, remove barriers and mobilise finance. → Government-facilitated planning of strategic siting of OSW farms. → Design of the OFTO regime that includes consideration of energy system planning and opportunities for shifting between energy vectors.

Source/ [1]

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Introduction to Agencies of Marine Management in the UK

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Keyword: Marine and Coastal Access Act, Marine Management Organization, Department of Energy & Climate Change, Maritime and Coastguard Agency

As the exploration and understanding of the ocean have continued to expand, the government management of maritime affairs has increased for the United Kingdom, an island maritime country. Prior to 1999, the UK lacked a unified and comprehensive maritime and coastal area management policy framework. Rather, local governments would establish management measures specifically for their own localities. As a result, maritime and coastal area management plans and legal systems were complex and fragmentary, with a lack of coordination among regional management, marine management, and cross-regional management. The UK had up until that point been unable to form an overall maritime and coastal area management policy [1]. In 2002, the British government promulgated the Marine Stewardship Report, under the theme of realizing their vision for the marine environment. The Report clearly stated that the United Kingdom needed a new method for managing the entirety of marine activities; it also needed to pass legislation to ensure that the method could be implemented correctly. In 2009, in order to achieve the sustainable development of the marine environment and ocean economy, the UK reiterated its vision for the marine environment as "clean, healthy, safe, productive and biologically diverse oceans and seas." In the same year, the Marine and Coastal Access Act 2009 was approved and brought into effect. The Act covers all aspects of marine management development and protection, and establishes a comprehensive marine management structure so as to better respond to the challenges of marine governance in the future. In the following, this article will introduce the major agencies of marine management in the UK as well as their main functions, including Marine Management Organization, Department of Energy & Climate Change, and Maritime and Coastguard Agency.

The Marine Management Organization (MMO)

The UK Marine and Coastal Access Act contains 11 sections (Figure 1): The Marine Management Organization (MMO); Exclusive Economic Zone, UK Marine Area and Welsh Zone; Marine Planning; Marine Licensing; Nature Conservation; Management of Inshore Fisheries; Fisheries; Enforcement; Coastal Access; Miscellaneous; Supplementary Provisions [2]. In terms of marine management, the Act introduces a new system of marine management, including an overall marine planning system for achieving the British government's marine environment strategic goals as well as specific marine development plans to be adopted for the governance of various sea areas [3]. Looking to solve issues of decentralized marine management, the British government established an independent marine

management agency under its Department for Environment, Food and Rural Affairs (DEFRA) in accordance with the UK Marine and Coastal Access Act in 2010. That agency is the MMO. It also provided that the MMO is a specialized unit under the British government that performs a number of marine protection functions, with the goal of achieving the sustainable development of British oceans.

Before the establishment of the MMO, the various responsibilities of marine management and marine development planning in the UK were taken up or supported by separate units, such as the Department of Energy; Department of Trade and Industry; Ministry of Defense; DEFRA; Ministry of Agriculture, Fisheries and Food; Department of Science and Education; Engineering and Physical Sciences Research Council (EPSRC); and Natural Capital Committee. There was no coordinating agency or organization expressly responsible for marine management and development. The establishment of the MMO could effectively solve diverse problems stemming from: unclear division of management responsibilities among various agencies which were scattered across various management systems; decentralized systems of law enforcement; and lack of effective organization in marine development andutilization. More importantly, after the establishment of the MMO, the departments or organizations which had previously taken responsibility for marine management and development in the UK were not made completely defunct, but rather comprehensively managed by the MMO, which maintains close cooperation and contact with previous agencies and promotes coordination and cooperation among various ministries, thus avoiding the emergence of management with "too many managers" [4][5].

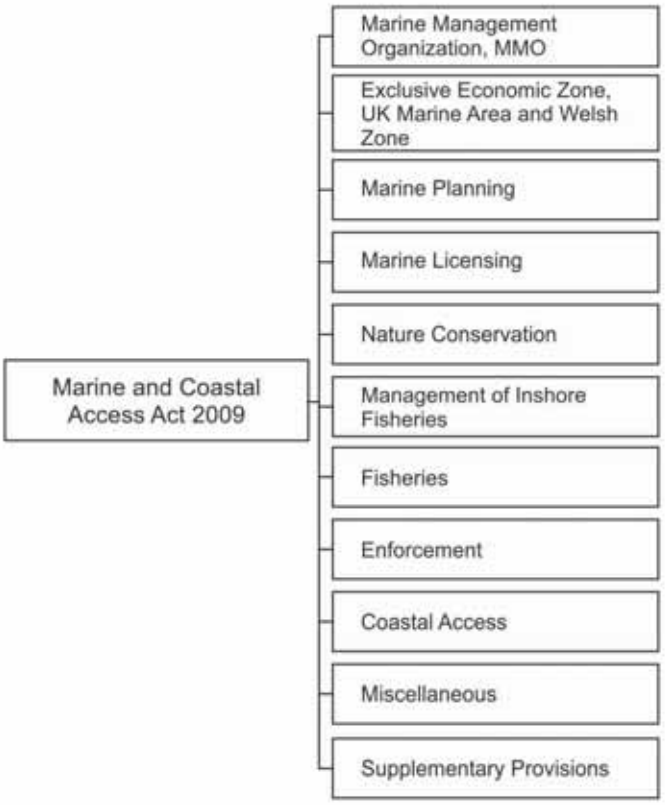

Figure 1/ The structure of the UK Marine and Coastal Access Act
Source/ [2]

According to the Marine and Coastal Access Act, the MMO is responsible for reforming marine and coastal zone management, including the establishment of planning policies, marine fishery management and resource conservation, nature conservation, marine planning, and the production and installation of renewable energy. The responsibilities of the MMO also include the management of the European Maritime and Fisheries Fund, port control, marine fisheries, maritime permits, oil spills, wildlife and habitat conservation, fishing vessel permits, and many other matters related to marine utilization. Among which, marine planning is of highest importance. The Marine and Coastal Access Act introduces the concept of marine planning for sea area management, which the British government uses to guide or influence decision-making on the utilization of sea areas. Therefore, the many activities already carried out at sea as well as new types of maritime activities all require authorization or permits. For example, this includes: Coastal and marine development, offshore wind farm installation, wave and tidal energy development, and marine dredging [6].

When the MMO began to develop marine planning, it would use data on the sea area space, its use, and other data, and constantly review such use. Facilitated by this process, a marine planning database was established. The database contains: Results of the evaluation of characteristics of each sea area, available and required data, interactions among various maritime activities, current use of each sea area as well as the emerging and future use, and future plans for sea area development. Spatial analysis and planning for sea areas can identify known and common conflicts in use among various marine activities, which then allow the MMO to use marine planning to design and provide the most suitable management plan [7]. When the plan is subsequently adopted, the MMO continues to monitor its implementation results. It reviews the implementation of various plans every 3 years and modifies or replaces certain plans when necessary. When modification or replacement is warranted, the MMO also follows a standard procedure—scoping, planning, preparation and evaluation, consultation, modification and execution (Figure 2). Over the past 10 years, the MMO has developed a reliant framework for marine planning, permits, and regulation, one that can maintain the sustainable development of the British marine environment and ocean economy. After re-examining its management responsibilities, the MMO now hopes to achieve the following goals by 2030 [8]:

- Realize sustainable ocean development
- Provide opportunities for sustainable fishing
- Conserve marine habitats and wildlife
- Manage maritime funding
- Provide regulatory support and assurance
- Support global ocean protection

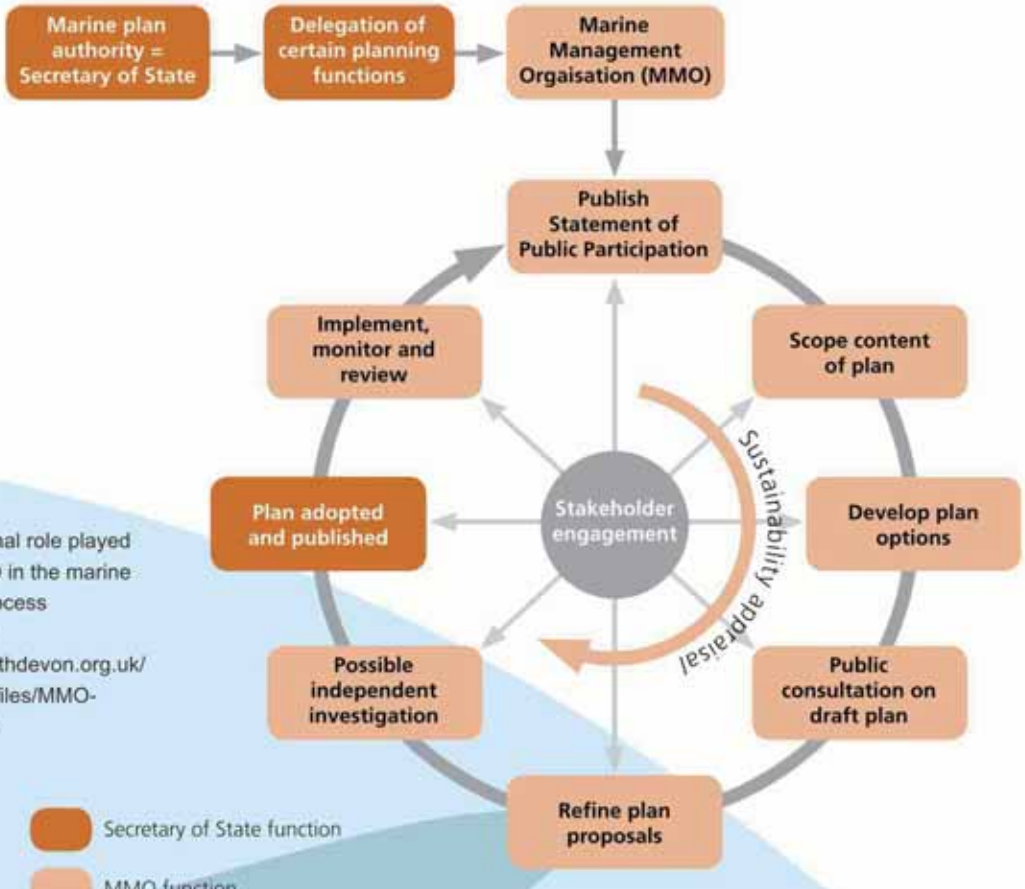

Figure 2/ The functional role played by the MMO in the marine planning process
Source/ https://www.coastwisenorthdevon.org.uk/sites/default/files/MMO-brochure.pdf

Department of Energy & Climate Change (DECC)

In order to adapt to climate change, the British Parliament passed the Climate Change Act in November 2008, the first such act in the world, thereby setting a legally binding target for reducing greenhouse gas emissions. For the reduction of GHG emissions - taking 1990-level emissions as its baseline, the UK will reduce GHG emissions to a level 80% lower than that of 1990 by 2050. The passing of the Climate Change Act was regarded as a historic step, and has received widespread support from politicians and leaders, media, environmentalists, trade unions, and businesses. The Climate Change Act has since taken its place in the core leadership role for climate change [9].

The Climate Change Act provides two innovations on the institutional level: The establishment of the Committee on Climate Change and the Department of Energy & Climate Change (DECC). The Committee on Climate Change is an independent, non-governmental organization composed of experts. Its main function is to provide professional advice addressing climate change issues to the British government and Parliament. The Committee makes recommendations on the UK's Carbon Budget and regularly reports to Parliament on progress in reducing GHG emissions [9]. The DECC was founded in 2008 "to make sure the UK has secure, clean, affordable energy supplies and promote international action to mitigate climate change" [10]. To this end, the British government has combined the UK's energy policy (previously the responsibility of the Department for Business, Enterprise and Regulatory Reform, BERR) and climate change mitigation policy (previously the responsibility of the DEFRA) and handed it over to the DECC. First, the DECC proposes policies for climate change response based on two major goals, and makes legislation to regulate renewable and non-renewable energies in the UK (the Petroleum Act of 1998; Energy Act of 2008, 2010, and 2011; and the Climate Change Act of 2008). Its actual efforts reflect the fact that climate change and energy policy are inseparable. In addition, the DECC also retains its responsibility for permitting, exploration, and supervision of various oil and gas developments on the British continental shelf [4].

Maritime and Coastguard Agency (MCA)

The Maritime and Coastguard Agency (MCA) is an executive agency under the Department for Transport (DfT). Its vision is to become the world's preeminent maritime safety organization, to promote a safer life, safer ships, and cleaner oceans for the UK. The main role of the MCA is to prevent loss of life and property on the coast and at sea, to formulate regulations and guidelines for maritime affairs, and to provide various certifications for seafarers. The MCA plays an important role in the safety and maintenance of the marine environment throughout the United Kingdom; it is committed to achieving the DfT's goals, namely promoting opportunities for economic growth and development as well as improving the maritime navigation environment to provide a safe, reliable, and sustainable transportation process with higher efficiency. Its main work includes [11]:

- Formulating regulations and guidelines; providing certification for ships and seafarers. The MCA, using its investigation and inspection system, is able to realize ship safety, ensure safety, prevent pollution, and provide for the health, safety and welfare of mariners.
- MCA provides a national 24-hour maritime and coastal search and rescue (SAR) emergency response service for the entirety of the United Kingdom.
- Improve maritime safety, promote economic growth, and minimize the impact of the maritime sector on the environment by joint cooperation with strategic partners (the National Strategy for Maritime Security and the UK Ship Register).

In 2020, the MCA submitted an internal plan (The Big Three) that outlines the main goals to be achieved over the following three years. These three main goals cover three major themes [11]:

- **Safety and sustainability:** Work with partners to improve maritime safety, mitigate environmental impact, and reduce the number of deaths in coastal areas.
- **Maritime growth:** Provide higher quality services to enhance the reputation of British maritime services; attract more clients to the UK Ship Register and other maritime agencies.
- **Maritime innovation:** Enable the UK to take the lead in the field of maritime innovation through cooperation with industry, governmental departments, and academia, and development and utilization of new methods, opportunities and technologies.

Conclusions

Since 1999, the British government has developed its marine and coastal management policy into a nationally integrated management structure. The national level of maritime planning and formulation of marine protected areas showcases the successful transformation of British marine and coastal area management policy into a national-level framework that covers planning and overall marine management, and this is especially true after the promulgation of the Marine and Coastal Access Act. Similarly, the British government recognizes that stakeholders and organizations have their own important roles to play in the decision-making process of various marine affairs management policies. Legislation can provide solid and robust legal support to the overseeing authorities. The DECC established by the Climate Change Act is one clear example. The British government has handed over the energy policy and climate change mitigation policies, both of which inextricably linked to the issue of climate change, to the DECC, and has introduced a holistic climate change response strategy. A holistic and comprehensive marine management structure indicates the management of various maritime affairs issues. However, looking from the perspective of its marine management structure, it is impossible for a single agency to take responsibility for the overall management of maritime affairs, especially at the national level. Therefore, it is imperative that various maritime affairs issues and activities be supervised by respective governmental departments. Special laws and specialized agencies are required for overseeing the work toward certain goals as well as the coordination and cooperation among key agencies. In such a way, the management of Taiwan's marine environment and maritime affairs may be accomplished.

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Promotion of the Blue Belt Programme in UK Overseas Territories and Ocean Monitoring Technology

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In the 19th century, the UK government was known as the "the Empire on which the sun never sets". Today, it still possesses 14 territories outside of the UK, which are called UK Overseas Territories [1]. The geographic scope of these overseas territories spans across the Pacific, Atlantic, Antarctic, and Indian oceans, from the tropics to the Antarctic Circle. They are sparsely populated and are rich in marine resources. The total area of Marine Protected Areas (MPAs) of the UK Overseas Territories exceeds 4 million km^2, which is equivalent to 17 times the size of the United Kingdom or about 1% of the Earth's oceans. However, these overseas territories have very small populations, they are in Exclusive Economic Zones (EEZs) that are subject to Illegal, Unreported and Unregulated (IUU) fisheries, and face issues related to global climate change, so they are in urgently need of support in the form of external resources and human resources. Responding to such concerns, the UK government declared that it would provide long-term support, and planned to connect the sea areas scattered throughout its overseas territories into a blue belt MPA that spans four oceans.

Figure 1/ Coral reef survey at Pitcairn Islands
Source/ GOV.UK
https://marinescience.blog.gov.uk/tag/blue-belt-programme/

UK Blue Belt Programme

The UK government has invested more than 20 million pounds (approximately NT$790 million) in combining the scientific research capabilities of the Centre for Environment, Fisheries and Aquaculture Science (Cefas) with the surveillance and enforcement capacity of the Marine Management Organization (MMO). It also cooperates with external academic units, NGOs, and stakeholders in the 7 participating UK Overseas Territories (1 in the Pacific Ocean, 1 in the Indian Ocean, 4 in the Atlantic Ocean, and 1 in the Antarctic). The Blue Belt Programme was implemented for the first time over a period of 5 years (2016–2020), with the claim of being the world's largest marine conservation project.

Table 1/ The 7 UK Overseas Territories participating in the Blue Belt Programme

Name	Geographic location	Area of territory	Permanent inhabitants	Unique biological resources
Pitcairn Islands	South Pacific	47km^2	54	Pristine coral atolls, important breeding grounds for seabirds and humpback whales
British Antarctic Territory (Not internationally recognized)	Antarctic Circle	1.7 million km^2	0	Important habitat for penguins
South Georgia & the South Sandwich Islands (SGSSI)	South Atlantic	3,755km^2	0	Important habitat for penguins and migratory cetaceans
Tristan da Cunha	South Atlantic	98km^2	261	Important habitat for seabirds, endemic species, lobster export industry
St Helena	South Atlantic	122km^2	4,000	Oceanic migration routes for sea turtles and cetaceans, and endemic species of butterfly fish
Ascension Island	South Atlantic	90km^2	873	Important habitat for seabirds and sea turtles
British Indian Ocean Territory (BIOT)	Indian Ocean	60km^2	0	Marine biodiversity hotspot

Source/ GOV.UK [1][2]; organized for this paper

Figure 2/ The geographic scope of the UK Blue Belt Programme spans the Pacific, Atlantic, Antarctic, and Indian oceans
Source/ GOV.UK
https://www.gov.uk/guidance/the-blue-belt-programme

The Blue Belt Programme is promoted not only to assist UK Overseas Territories, but it is also a core leadership action of the UK government intended to address serious global ocean issues. They have demonstrated, using scientific investigations, the benefits of the Blue Belt Programme on such global ocean issues as over-fishing, species extinction, plastic pollution, and climate change. At the same time, the UK government has supported more than 4 million km^2 of MPAs in UK Overseas Territories, thereby demonstrating its commitment to protect at least 30% of the global ocean as MPAs by 2030.

Enhance management of MPAs in overseas territories

The goals of the Blue Belt Programme include improving scientific understanding of the marine environment; assisting in the development and implementation of evidence-based, tailored marine management strategies (including surveillance and enforcement); and providing support to ensure sustainable and long-term management. The following is a summary of the UK's strategy to strengthen MPAs in overseas territories:

I. Cooperating with scientific research institutes to conduct marine surveys of the South Atlantic

- In Tristan da Cunha and St Helena, two marine surveys were conducted, human resource training in UK Overseas Territories was completed during the 10,000 nautical voyage, and a 100,000 km^2 seabed map (including 12 seamounts) was drawn up.
- In SGSSI, two marine surveys were conducted, 4,000 photos and 30 hours of video were produced for research and analysis, 500 specimens were contributed to museum collections and used in the Darwin Tree of Life project.

II. Understanding and protecting biodiversity

- Participated in the organization and issuing of local Blue Belt Symposiums.
- Established models to predict where vulnerable habitats are located in MPAs.
- Applied the results of marine surveys, for instance: Seabed maps produced to improve MPA management plans.
- Provided a new vessel to Tristan da Cunha for inshore biodiversity monitoring, and their fisheries patrol vessel was refurbished.

III. Strengthening governance

- Supported local administrative departments in conducting the first 5-year retrospective review of the management of MPAs.
- Provided information on important habitats, important species, and their threats for the development of local marine protection strategies.
- To assist local council in the adoption of the most appropriate legislative model and implement policy analysis. Examples: Providing analysis, evidence, and advice to support the decision of the local council of Ascension Island to designate 100% of their EEZ as a MPA.
- Funded local counsel to help local authorities to produce the laws and regulations necessary for effectively manage and enforce laws in their waters.
- Supported the development of marine management and action plans to sustainably manage and monitor MPAs.

IV. Managing human impacts

- Supported the Maritime and Coastguard Agency (MCA) and the GB Non-Native Species Secretariat in cooperation with the overseas territories to understand the territories' capacity to respond to marine pollution emergencies and invasive species.
- Supported the St Helena government's development of strategies to manage human activities including marine tourism, water quality and sand extraction.
- Supported Pitcairn Islands development of a code of conduct for whale watching. Provided assistance to create a booklet and a leaflet to communicate the code of conduct to the local community and visitors and supported practical training for the community.
- Conducted water quality surveys around the BIOT, the results of which will help the BIOT manage human activities.

V. Supporting sustainable fisheries management

- Undertook the review of all aspects of local fishery development.
- Cooperate with scientists to develop satellite surveillance to support enforcement and explore alternative surveillance tools in the region.
- Procured and deployed camera systems on research and commercial fishing vessels to empirically manage the effectiveness of suggestions.

- Provided capacity building to staff from local fisheries departments, including vessel maintenance, sea survival techniques, compliance and enforcement, and data management.
- Supported the UK Overseas Territories to improve compliance with International Commission for the Conservation of Atlantic Tunas (ICCAT) measures, contributing valuable scientific evidence for the regional management of migratory species.
- Over 1,500 fish have been tagged and local staff have been trained in electronic tagging techniques to support ongoing monitoring.

VI. Supporting compliance and enforcement

- Dispatched maritime patrol officers to join patrols that span UK Overseas Territories.
- Developed a formal procedure for gathering and recording information on fishing vessel activities supporting compliance and enforcement.
- Provided on-island and online training to staff, such as: Providing training in compliance and enforcement for fisheries department staff and supporting the training of additional scientific observers to monitor fishing operations.
- Built St Helena's capacity by funding an on-island coordinator, a marine enforcement officer, a fisheries officer and a new laboratory which, once complete, can enable marine science studies and monitoring.
- Developed a Blue Belt surveillance and intelligence hub providing on going intelligence and live operational support during a multiagency operation which resulted in the interception, detention, and prosecution of vessels fishing illegally in the local area.
- Researched current and future technologies the territories may adopt or invest in to help identify illegal activities, such as: Applying satellite imagery over an area of more than 142 million km^2 to conduct risk management for target surveillance activities; conducted unmanned aerial vehicle (UAVs) tests to improve effectiveness in supporting on-site patrols and identifying illegal fishing vessels.

Ocean monitoring technology applications

The UK Overseas Territories are both extremely remote and vast in their extent. In order to achieve monitoring and management, MMO and Cefas along with consultants published a review of the technology application review in 2019 [3]. That review includes existing technologies as well as emerging technologies that have been funded by the UK government and the European Union since 2005; it comprehensively applies multiple technologies to the territories in the Blue Belt Programme in accordance with the requirements of each territory. The ultimate goal of these technologies is to establish a maritime safety technology streaming system which can provide information for fishery management while also combating IUU fisheries and other illegal activities.

Existing technologies include aerial drones; passive acoustic monitoring; Unmanned Surface Vessels (USVs); biological genetic analysis; microchemical analysis using otolith or scales; morphometric analysis; stable isotope analysis; satellite telemetry; Automatic Identification System (AIS) analysis; ground/buoy based radar; Argo floats; and Modular Electronic Warfare System (MEWS) used to detect ship radar and high-frequency emissions.

In another aspect, the Blue Belt Programme cooperated with Blue Abacus in the use of Baited Remote Underwater Video Systems (BRUVS) [4]. Since it uses bait to attract migratory fish of epipelagic zone, it is similar in effect to a Fish Aggregation Device (FAD). Target species include shark, tuna, mahi mahi, and other fish. Most of these species belong to the top consumer food webs, and their global numbers are in decline. One advantage of the BRUVS is that it can collect data such as stock abundance without harming the fish. It also helps to improve the long-term lack of offshore fishery data in the EEZs of UK Overseas Territories.

The next phase of the UK Blue Belt Programme

The benefits of the UK Blue Belt Programme from 2016 to 2020 are still in effect in overseas territories. With the assistance of this programme, Tristan da Cunha officially released a five-year marine management plan in September 2021 [5] and signed an agreement for the establishment of the largest MPA in the Atlantic Ocean, thus setting a milestone for local marine environmental management. Under the group initiative, the UK government is calling on new UK Overseas Territories to join. It will continue to cooperate with UK Overseas Territories, external academic institutions, NGOs, and stakeholders to support the implementation of current management plans, surveillance, as well as regulations and law enforcement. In addition, by supporting infrastructure and human resource training and building capabilities and technologies in UK Overseas Territories to enable long-term implementation of the Programme, it can ensure that the highly biodiverse and unique, pristine marine environments can be maintained and protected. At the same time, it showcases the effectiveness of the integrated management system in existing MPAs.

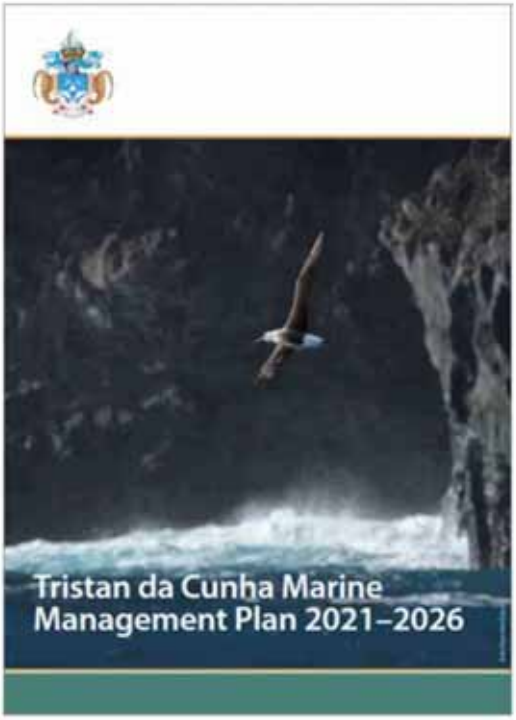

Figure 3/ Tristan da Cunha announces its 5-year ocean management plan
Source/ Tristan da Cunha Government & Tristan da Cunha Association
https://www.tristandc.com/wildlife/news-2021-09-21-mmp.php

Conclusions

According to statistics up to May 2021 from the Ocean Conservation Administration, there are 46 MPAs in Taiwan covering a total area of about 5,264 km^2, of which 8.17% are in Taiwanese territorial waters [6]. Among them, one protected area distant from the main island of Taiwan and which is not easily accessible is part of the Dongsha Marine National Park. As for Nansha Taiping Island, located south of Taiwan, the National Academy of Marine Research (NAMR) cooperated with the Biodiversity Research Center of the Academia Sinica this year to survey coral reefs and sea turtles; it also plans to build a marine research station on Nansha Taiping Island in the future. By learning from the experience of the UK Blue Belt Programme, NAMR will strengthen the surveying and research of marine biodiversity to provide a scientific basis for the support of management practices and enhancement of enforcement, thereby ensuring the sustainability of the pristine, unique, and diverse marine environment of the Taiwanese territorial waters in the South China Sea.

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Introduction to the Management of Marine Activities—Management of Marine Non-licensable Activities in England

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Translated by Linguitronics
Keyword: Marine non-licensable activities, maritime permit exemption system, marine management organizations

The Marine Management Organization (MMO) is a non-governmental public executive body responsible for the protection and management of waters in England. It is invested with the power to formulate regulations and marine planning policies. In England, Marine Protected Area (MPA), Marine Conservation Zones (MCZ), Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPA), and Special Areas of Conservation (SAC) that do not require maritime licenses for beach recreational and water activities are directly or indirectly regulated and managed to achieve the protection of MPAs. This article mainly introduces the Management of Marine Non-licensable Activities in England, and content of which includes management of water sports activities, for instance on-shore beach recreation and bait collection for recreational sea fishing, as well as activities involving sailing and motorboats. (The content of this article is mainly derived from the Management of Marine Non-Licensable Activities in England [1].)

Legal Development

In 2009, the British Parliament formulated the Marine and Coastal Access Act, 2009, and established the Marine Management Organization (MMO). To conduct maritime activities in sea areas and rivers below the high tide line and within areas affected by the tides, the person in question needs to apply for a marine license from the MMO. However, maritime activities that have little impact on the environment or are temporary can be exempted on the basis of Marine Licensing Exempted Activities [2]; such activities can be exempted by filing in advance provided that they meet the relevant qualification standards.

Regarding the overlapping of powers between the MMO and other management departments in regulating and managing marine non-licensable activities, the formulation of the Management of Marine Non-licensable Activities in England provides an explanation on the scope of powers of the MMO. Better control principles are used to manage the coast and activities to reduce the burden of regulations, especially to avoid unnecessary overlapping of management rules.

Introduction to the Key Agencies that Manage Beach Recreation and Water Activities in England

I. Inshore Fisheries and Conservation Authorities (IFCA)
Article 155 of the Marine and Coastal Access Act empowers the IFCA to formulate territorial marine regulations on the development of fishery resources, including recreational fishing activities such as sea angling and digging for bait.

II. Harbour Authorities
Most harbour authorities only formulate regulations for ship navigation; however, based on the powers and objectives of conservation management, the harbour authority can delimit the harbour's restricted navigational area in accordance with a Harbour Revision Order or Harbour Empowerment Order.

III. Local Authorities
On the basis of local methods—Alternative Procedure (England) 2016, local authorities such as the local councils and the London City Council have the right to formulate and modify "seashore" laws and regulations, including those regulating seashore activities and dog walking on beaches. Unless otherwise specified, local competent authorities are required to make decisions on whether to authorize or enforce decisions on land-based activities above the low-tide line in accordance with appropriate ocean policies, such as the Marine Planning or the Marine Policy Statement.

IV. Marine Management Organization (MMO)
The MMO formulates marine conservation management regulations in accordance with the law to promote the conservation goals of MCZ in England. Including "prohibition or restriction of personnel entry to a site," "movement or other activity," "prohibition or restriction of any ship's mooring or anchoring" within MCZs; and when the site is in urgent need of protection, formulate emergency and temporary management regulations. In order to protect European Marine Sites (EMS) as sites containing animals, plants and habitats that are considered rare, special or threatened, the MMO has established SAC and SPA to protect important bird species.

V. Statutory Nature Conservation Bodies
Natural England is an adviser for the natural environment established by the British government. It has the power to formulate regulations for the intertidal zones of SSSIs and National Nature Reserves (NNRs). In addition, a Special Nature Conservation Order (SNCO) to protect the natural environment can be requested from the British Home Secretary. After the order takes effect, legally effective "stop notices" are issued on behalf of the government declaring that certain activities are not allowed.

British Beach Recreational and Water Activities Management Strategy

The following three management strategies are summarized from the Managing Marine Recreational Activities: a Review of Evidence (NECR242):

I. On-site access management
- designate areas for particular (fixed) activities.
- provision of designated access points and locations.

II. Education and communication with the public and site users
- using signs, interpretation and leaflets (guides) to convey management strategies and legal norms.
- implement and practice voluntary codes of conduct.
- managing (wardening).
- provide off-site education/information to local clubs/training centres and/or residents.

III. Legal enforcement
- byelaws which can be created by a range of bodies including regulators, local authorities and landowners.
- permitting or licence conditions.

MMO Exclusive Management of Marine Non-licensable Activities

MMO Exclusive Jurisdiction of Marine Non-licensable Activities include: "Walking and dog walking," "motorised and non-motorised vehicles for land-based activities," "general beach leisure and recreational activities," "observing wildlife from shore," "coasteering," and "bait collection." However, many seaside activities are currently managed by their respective competent authorities. The MMO suggests that activities be managed in a way that does not add to the number of management levels, so as to reduce the overlapping of management between ocean management organizations and other competent authorities.

I. Walking and dog walking
Public Spaces Protection Orders (PSPOs) give local authorities and land owners the power to manage walking and dog-walking activities in coastal or intertidal zones under their jurisdiction; the authorities and owners have the obligation to inform the public of the content of such protection orders and the penalties for violation.

II. Motorised and non-motorised vehicles for land-based activities
Land vehicles used for beach activities, include: motorised four-wheeled all-terrain vehicles (ATV), light utility vehicles (LUV), off-road modified two-wheeled street vehicles or four-wheeled motorhomes, and non-motorised, land-based, off-road vehicles powered by sails or kites and kite skateboards.

According to the Road Traffic Act (1988), motorised vehicles are not allowed to drive in coastal areas; and land-based vehicles powered by sails must drive on wide sandy beaches with flat, planned routes. The national management organization KiteSports manages all kite-powered sports in England; and the private organization British Landsailing (BFSLYC) is an advisory body for onshore sailing activities. Both of these organizations formulate safety codes of conduct and operating specifications for land-based vehicles powered by sails. They include restrictions on the scope of activity and time and season of activity. Club members must comply with ecological protection measures and conduct non-motorised land-sailing and kite off-roading activities under the supervision and management of their respective clubs.

III. General beach leisure and recreational activities
General beach leisure and recreational activities as defined in this article refer to beach games, walking, sunbathing, tide pool exploration, and swimming at the seashore, most of which are managed by local competent authorities and environmental non-governmental bodies by the use of notice boards and signs to prevent stepping on sand dunes or marking of ecologically sensitive areas. Publicity publications (publicity leaflets) are used to publicize and encourage administrators and volunteers to abide by codes of conduct, so as to reduce the impact of activities on marine and coastal environment and wildlife.

IV. Observation of wildlife from shore
This refers to observing a series of marine species such as marine mammals, basking sharks, and birds from the land. There is currently no government agency in England regulating commercial wildlife observation activities. Examples of management cases: Although Winterton-Horsey Dunes SSSI is not designated for the protection of seals, it is a model case of wildlife observation from shore. The "Seal Keeper Project" initiated by the cooperation of several public and private organizations encourages tourists to respect the voluntary closure of beaches from November to January each year and to protect the gray seal population from public interference. A warden team composed of 100 volunteers provides

guidance on seal observation on site and on the Internet, and promotes the Countryside Code and Photographers' Code of Practice. It teaches on-site visitors how to carry out seal counting and additional monitoring and investigation work, thus enhancing visitors' ability to understand and observe gray seals. It also implements beach cleaning activities after the tourist season in preparation for the seal breeding season.

V. Coasteering

Coasteering is an adventure exploration activity that traverses the intertidal zone, sub-tidal zone, and the coastal area. The activity culminates in climbing, walking, swimming, or diving, and is done without the aid of boats, surfboards, or other large buoys. There is currently no government agency managing coasteering activities in England. The National Coasteering Charter (NCC) is a coasteering consulting organization that provides experience and activity guides for coasteering. A voluntary agreement has been signed with the British Mountaineering Council to manage coasteering activities to prevent coasteering activities from disturbing seabirds and seals during sensitive periods.

VI. Bait collection

In England, bait collection activities are classified as marine fishery resources and fall under the jurisdiction of the Inshore Fisheries and Conservation Authority. Natural England is responsible for the management of bait collection activities in SSSIs and NNRs. Digging for bait is defined as "fishing", and fishing activities require a license issued by the competent authority. Although England has listed this activity as a beach recreational and water activity that does not require a license, the management and legal restrictions on bait digging may still differ with each local authority.

Bait collection activities are managed in the following four primary directions:

- Prohibition of all bait collection activities.
- Authorization and assessment: Prohibition of bait collection activities that have not been authorized or pre-assessed.
- Restrictions on the total amount: the total amount of marine segmented worms (Annelida) collected is restricted to 1 kg/day.
- Set up special collection areas: anglers can collect bait for their own use, but are prohibited from reselling collected bait.

Conclusions

Driven by the British government's goals for "clean," "healthy," "safe," "productive," and "biodiverse" oceans, the Management of Marine Non-licensable Activities in England is used to reduce the overlapping of ocean management among the MMO and other competent authorities. It aims to achieve the protection and improvement of the marine environment without adding to the number of management levels. And through the management mechanisms and strategies of "on-site access management," "education and communication with the public and site users," and "legal enforcement," it endeavors to achieve sustainable marine activities and development, and to protect the fragile habitats and species in British waters.

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