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Challenges and solutions to deploying floating offshore wind power in Japan (1)

Developing offshore wind power in the Exclusive Economic Zone

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Introduction

Given Japan's small land area and limited land for renewable energy, offshore wind power generation is a promising technology for the massive introduction of renewable energy. However, the waters surrounding Japan have limited sea area with a depth of 50-60m, which is suitable for mature fixed-bottom offshore wind power technologies; and therefore, floating offshore wind power technologies are called for. In addition, Japan has an urgent need to harness offshore wind power in its Exclusive Economic Zones (EEZs), which is one of the largest in the world.

This report is published in a series of three articles on the challenges and prospects for the introduction of floating offshore wind power in Japan: "Introduction of Wind Power in Japan's EEZ," "Floating Offshore Wind Power as an Industrial Policy," and "Summary and Recommendations".

1 Offshore wind power trends

1.1 Offshore wind power potential and targets

Offshore wind power holds great potential in increasing the world's share of renewable energy. According to ESMAP (2019)[1] and IEA (2019)[2] there are over 71,000 GW and 120,000 GW, respectively, of technically extractable offshore wind resources globally. IRENA and GWEC (2023)[3] points out that to remain on track to meet the 1.5°C target of the Paris Agreement, 500 GW of global offshore wind installations will be needed by 2030. This is around eightfold of cumulative offshore wind energy capacity installed globally in 2022, which amounted to 63.2 GW[4].

In 2022, China accounted for almost half of total installed offshore wind capacity, which was almost equivalent to total installed capacity across Europe, where the UK had the largest share, followed by Germany and the Netherlands. Japan's installed capacity stood at 61MW in 2022. (Figure 1-1)

[1] ESMAP (2021), *Energy Sector Management Assistance Program Annual Report 2021*, International Bank for Reconstruction and Development / The World Bank https://documents1.worldbank.org/curated/en/615511640189474271/pdf/Energy-Sector-Management-Assistance-Program-ESMAP-Annual-Report-2021.pdf

[2] IEA (2019), *Offshore Wind Outlook 2019: World Energy Outlook Special Report,* https://iea.blob.core.windows.net/assets/495ab264-4ddf-4b68-b9c0-514295ff40a7/Offshore_Wind_Outlook_2019.pdf

[3] IRENA and GWEC (2023), *Enabling frameworks for offshore wind scaleup: Innovations in permitting*, International Renewable Energy Agency, https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Sep/IRENA_GWEC_Enabling_frameworks_offshore_wind_2023.pdf8

[4] IRENA (2023), *Renewable capacity statistics 2023,* https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Mar/IRENA_RE_Capacity_Statistics_2023.pdf

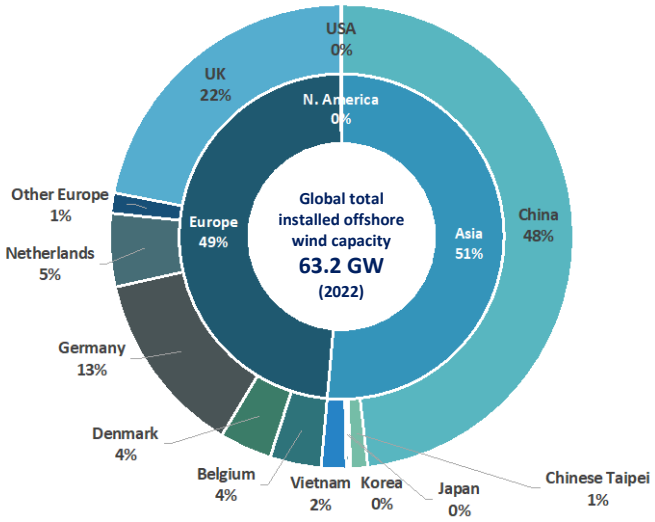

FIGURE 1-1 SHARE OF GLOBAL CUMULATIVE INSTALLED CAPACITY OF OFFSHORE WIND (2022)

Source: IRENA Renewable capacity statistics 2023

Japan has the technical potential of generating more than 9,000 TWh per year[5]. This includes not only Japan's territorial seas but also its Exclusive Economic Zone (EEZ)[6], which together has the sixth largest area in the world (Table 1-1). Given that its electric power demand in 2022 was around 870 TWh, Japan can produce nine times its demand with offshore wind power.

TABLE 1-1 AREA OF TERRITORIAL SEAS AND EXCLUSIVE ECONOMIC ZONES (EEZ)

	Territorial seas + EEZ (million km²)	Percentage relative to total land area	Total land area (million km²)
U.S.A.	7.62	80%	9.63
Australia	7.01	90%	7.69
Indonesia	5.41	290%	1.90
New Zealand	4.83	1790%	0.27
Canada	4.70	50%	9.98
Japan	4.47	1180%	0.38

Source: METI (2023) [7]

1.1 Japan's offshore wind power policy

In June 2021, the Japanese government launched the Green Growth Strategy[8], in which it positioned offshore wind power as one of the fourteen key industrial fields where future growth is expected and set out

[5] IEA (2019), *op. cit.*

[6] An Exclusive Economic Zone (EEZ) is an area of the ocean, generally extending beyond a nation's territorial sea to no more than 200 nautical miles (around 370 km) from the coast of a state, within which a coastal nation has jurisdiction over both living and nonliving resources.

[7] METI (2023), "Next-generation technologies for renewable energy" (Document 1 from the 57th meeting of the Subcommittee on Mass Introduction of Renewable Energy and Next-Generation Electricity Networks), https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/pdf/057_01_00.pdf

[8] Cabinet Secretariat, et al (2021), "Green Growth Strategy" https://www.meti.go.jp/english/policy/energy_environment/global_warming/ggs2050/pdf/ggs_full_en1013.pdf

the targets of introducing 10 GW of offshore wind power by 2030 and 30-45 GW, including floating offshore wind, by 2040, based on the first "Vision for the Offshore Wind Industry[9]." Considering its sea area, this target is modest in comparison with its Asian neighbors and other countries around the world that are implementing offshore wind power (Table 1-2).

TABLE 1-2 COMPARISON OF GOVERNMENT TARGETS FOR OFFSHORE WIND POWER DEPLOYMENT

Region/country	Targets		Name of policy	Year announced
	Offshore wind	Floating offshore wind		
Japan	2030 10GW 2040 30-45GW		Green Growth Strategy	2021
Korea	2034: 20.1 GW		Fifth Basic Plan for New and Renewable Energy[10]	2020
Taiwan	2040: 40-55GW		2050 Net-Zero Emissions Roadmap[11]	2022
Denmark	2030: 14GW 2050: 35GW		Wind Pledges - European Wind Power Action[12] THE DECLARATION OF ENERGY MINISTERS on The North Sea as a Green Power Plant of Europe [13]	2023 2022
Germany	2030: 30GW 2035: 40GW 2045: 70GW		Wind Energy at Sea Act (WindSeeG)[14]	2022
Netherlands	2031: 21GW 2040: 50GW 2050: 70GW		Wind Pledges - European Wind Power Action	2023
United Kingdom	2030: 50GW	2030: 5GW	British Energy Security Strategy[15]	2022
United States	2030: 30GW	2035: 15GW	Government press releases[16]	2021, 2022

Source: compiled by authors based on various sources

Note 1) Calculated based on target for wind power and target share for offshore wind power.

In Japan, the "Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities (Sea Areas Utilization for Renewable Energy Act)[17]" was enacted in 2018 to ensure that developers can occupy sea areas for offshore wind power generation for a maximum of 30

[9] Public-Private Council on Enhancement of Industrial Competitiveness for Offshore Wind Power Generation (2020) "Vision for Offshore Wind Industry" https://www.enecho.meti.go.jp/category/saving_and_new/saiene/yojo_furyoku/dl/vision/vision_first_en.pdf

[10] MOTIE (December 29, 2020 press release) ,"Fifth Basic Plan for New and Renewable Energy" https://www.motie.go.kr/kor/article/ATCL3f49a5a8c/163676/

[11] Climate Change Administration (2022) "Phased Goals and Actions Toward Net-Zero Transition" https://www.english-climatetalks.tw/_files/ugd/5e0d7e_5813cf454e2f48ba88b6b5823c8ac60e.pdf

[12] European Commission (2023), "Wind Pledges - European Wind Power Action," https://energy.ec.europa.eu/document/download/ff9911eb-4f53-497b-a6a6-84a64feeea60_en

[13] "THE DECLARATION OF ENERGY MINISTERS on The North Sea as a Green Power Plant of Europe," https://kefm.dk/Media/637884570050166016/Declaration%20of%20Energy%20Ministers%20(002).pdf (May 2022)

[14] BMJ (German Federal Ministry of Justice) (2023), "Offshore Wind Energy Act (WindSeeG)," https://www.gesetze-im-internet.de/windseeg/WindSeeG.pdf

[15] GOV.UK (2022), "British Energy Security Strategy" https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

[16] For 2030 target: The White House (March 20, 2021 press release) "FACT SHEET: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs" https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/; For 2035 floating offshore wind target: The White House (September 15, 2022 press release) "FACT SHEET: Biden-Harris Administration Announces New Actions to Expand U.S. Offshore Wind Energy" https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-actions-to-expand-u-s-offshore-wind-energy/

[17] Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities（Act No. 89 of 2018）, https://www.japaneselawtranslation.go.jp/en/laws/view/3580

years. The Act also establishes a framework for local coordination through councils with relevant stakeholders, including fishermen, vessel operators, and other parties who use the sea area.

The Sea Areas Utilization for Renewable Energy Act defines categories of suitable sites for offshore wind power generation according to their stage of progress made: "preparatory zones," "promising zones," and "promotion zones."[18] Preparation zones are designated based on the local willingness to commercialize offshore wind power projects. These areas are promoted to "promising zones" if they meet certain requirements provided in the Guidelines for Designation of Promotional Areas, such as the possibility of establishing a council which meets with the prefectural government and local officials to discuss the implementation of offshore wind power generation. If agreement is reached among the parties concerned, the sea area is designated as a "promotion zone" for which public tenders are held. By opening up promotion zones to generate approximately 1GW of offshore wind power every year for 10 consecutive years, Japan seeks to achieve its wind power deployment target.

1.2 Offshore wind power development in the EEZ

In order to achieve the target of introducing 30-45 GW of offshore wind power by 2040, Japan needs to accelerate the process of project approval and open up more sea areas for project development, given the lead time required for development.

A bill to amend the Sea Areas Utilization for Renewable Energy Act so that the sea area for offshore wind power development can be extended to the Exclusive Economic Zone (EEZ) is expected to be submitted to the Diet and the government has announced a call for public comments at the time of writing[19]. The amendment, based on discussions at the joint government committee meeting in January 2024[20], will introduce a two-step procedure for selecting offshore wind power projects in the EEZ, similar to those implemented in the U.K., U.S., and Australia.

Under the proposed scheme, potential project developers can select a project site in the larger "feasible sea area" designated by the government with consideration of fisheries, defense radars, and important sea routes, and apply with a draft zone map and draft plan for the installation of wind turbines and related facilities. Based on survey results and stakeholder coordination, the developer will submit the adjusted project plan and map to the government for evaluation. Permits will be issued to developers that meet the evaluation criteria. (Figure 1-2).

[18] As of October 2023, 10 promotions zones, 9 promising zones, and 8 preparatory zones have been designated.

[19] Public comments will be received via the government portal site from February 9 through 22, 2024.

[20] 22nd Joint meeting of the Working Group on Promoting Offshore Wind Power Generation (Subcommittee on Mass Introduction of Renewable Energy and Next-Generation Electricity Networks, Committee on Energy Efficiency and Renewable Energy, Advisory Committee for Natural Resources and Energy, METI) and the Subcommittee for Promoting Offshore Wind Power Generation (Environment Committee, Harbor Committee, Transport Policies Council, MLIT) (January 26, 2024) https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/yojo_furyoku/022.html

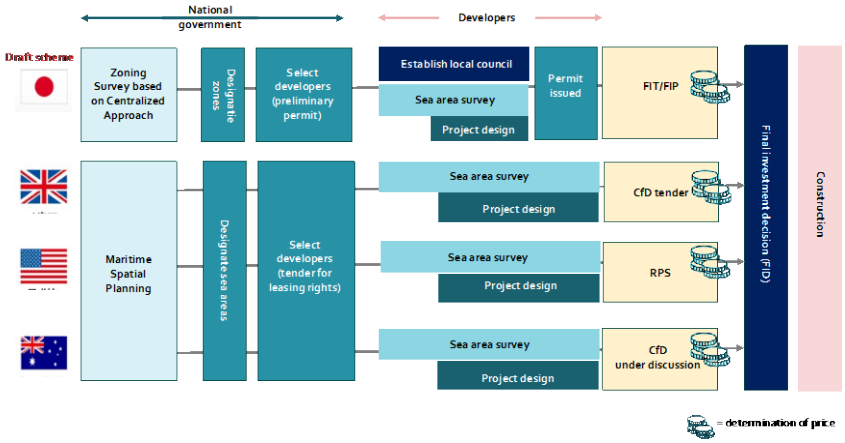

FIGURE 1-2 TWO-STEP PROCEDURE FOR PROJECT SELECTION IN THE EEZ

Source: adapted by authors based on material from 22nd Joint meeting of the Working Group on Promoting Offshore Wind Power Generation

Some European countries, including the U.K., Norway, Germany, the Netherlands, Denmark and Germany, already have offshore wind power projects in their EEZs in operation or in the pipeline. In Asia, China has several fixed-bottom offshore wind power projects under construction in its EEZ. Korea also has a number of projects planned in its EEZ, many of which are floating offshore wind power projects. Taiwan is amending its Renewable Energy Development Act to allow the construction of wind farms beyond its territorial seas[21].

Offshore wind power in the EEZ will be less exposed to NIMBY (not-in-my-backyard) issues compared to other variable renewable energy, such as onshore wind and solar power, but may involve conflict with other sectors such as fisheries and national security and also require consideration of compliance with international law, as discussed below.

2 Discussions on developing offshore wind power in the Exclusive Economic Zone

2.1 Compliance with international law

2.1.1 Right to produce electricity in the EEZ

Under the United Nations Convention on the Law of the Sea (UNCLOS) Article 56, paragraph 1(a), offshore wind power generation is included in “other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds.” The coastal State has sovereign rights over such activities. Coastal states also have the exclusive right to construct and to authorize and regulate the construction, operation and use of artificial islands and installations and structures for the purposes provided for in Article 56 and other economic purposes in the EEZs.[22] Therefore, the coastal State has exclusive rights over its wind farm, provided floating wind power generation facilities are defined to be “installations and structure” under Article 60.

UNCLOS does not expressly determine the legal status of a floating wind power generation facility. While fixed offshore wind are unarguably artificial installations, floating offshore wind, which sit on floating foundations that are moored or anchored to the seabed, can also be interpreted to be “ships” due to their

[21] Bureau of Energy, Ministry of Economic Affairs (July 12, 2023), “The Draft Amendment to Renewable Energy Development Act Passes Third Legislative Reading, Adding Regulations on "Solar Panel Installation on Buildings" and the "Chapter for Geothermal Energy” https://www.moea.gov.tw/MNS/english/news/News.aspx?kind=6&menu_id=176&news_id=110545

[22] UNCLOS Article 60 (1) (a)-(b)

mobility. Indeed, some countries such as Norway allow for the registration of floating devices other than ships[23] and the registration of the research floating wind turbine "Unitech Zephyros" under the Norwegian Ordinary Ship Register (NOR) is the first example of such registration[24]. Japanese domestic law (Electric Business Act, Law No. 170, 1964) also defines floating offshore wind farms as "special vessels" regulated under the Ship Safety Law (Law No. 11, 1933). If wind power generation facilities are to be defined as ships, the flag state would have jurisdictional rights. When the coastal state is not the flag state, this could potentially pose a threat to national security.

2.1.2 Electricity transmission rights

Article 79 of UNCLOS confirms "the right of the coastal State to establish conditions for cables or pipelines entering its territory or territorial sea, or its jurisdiction over cables and pipelines constructed or used in connection with the exploration of its continental shelf or exploitation of its resources or the operations of artificial islands, installations and structures under its jurisdiction" (Article 79 (4)). Yet, "all States are entitled to lay submarine cables and pipelines on the continental shelf" (Article 79 (1)), which poses a challenge for the coastal State when transmission lines or pipeline operated by another state already exists in its EEZ. In such cases, the coastal State will need to "have due regard to cables or pipelines already in position" (Article 79 (5)).

Conflict may be avoided if the coastal State had a maritime spatial plan that reserves a sea area for resource exploitation by the coastal State or for environmental conservation purposes. Germany has formulated a maritime spatial plan that covers its EEZ[25], where most of its offshore wind farms are located. The plan, originally formulated in 2009 and revised in 2021, ensures the transport of power generated in the EEZ to suitable transition points on the boundary of the territorial sea. Cable corridors are allocated in the maritime spatial plan but if submarine cables for the transport of power generated in the EEZ cannot run parallel to existing structures, they can cross priority areas for shipping by the shortest route possible. Germany's maritime spatial plan recognizes that although a single cable bears very little potential for conflict, the planned expansion of offshore wind energy will lead to an increase in the number of power cables, triggering the need for regulation.

2.1.3 Establishing safety zones

UNCLOS provides that coastal States may establish safety zones that do not exceed a distance of 500 m around offshore installations to ensure the safety of users of the marine environment and of the installations. This is most relevant during the construction phase; and there seems to be agreement among countries on this.

Germany's Offshore Wind Energy Act (WindSEEG 2017)[26] provides for the setting up of safety zones around the facilities in the EEZ (Section 53). The safety zone established for Hywind Borkum Riffgrund 3, Germany's largest offshore wind power project, is unique as the distance of 500 m is measured from the outer boundary of the wind farm. Whether or not establishing safety zones measured from the outer boundary of a group of turbines, thereby closing the entire wind farm area to other vessels, is acceptable may be debated in the future.

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[23] Section 33 of the Maritime Code allows for the registration of floating devices other than ships in the Norwegian Ordinary Ship Register. (Simonsen & Rostad, 2020)

[24] Siren Skalstad Ellensen, Alexander Severence, Andreas Helle (March 28, 2023), "Security when financing offshore wind projects in Norway" DLA Piper, https://norway.dlapiper.com/en/news/security-when-financing-offshore-wind-projects-norway-0

[25] BSH (German Federal Maritime and Hydrographic Agency) (2009) "Spatial Plan for the German Exclusive Economic Zone in the North Sea - Text section (unofficial translation)", https://www.bsh.de/EN/TOPICS/Offshore/Maritime_spatial_planning/Maritime_Spatial_Plans_2009/_Anlagen/Downloads/Raumordungsplan_Textteil_Nordsee.pdf?__blob=publicationFile&v=5

[26] BMJ (German Federal Ministry of Justice) (2017), "Offshore Wind Energy Act (WindSEEG)", http://www.gesetze-im-internet.de/windseeg/#download=1

Some other examples of safety zone practices in different countries are presented in Table 2-1.

TABLE 2-1 EXAMPLES OF SAFETY ZONE PRACTICES IN SELECTED COUNTRIES

	Hywind	Dogger Bank A	Borssele	Borkum Riffgrund 3	Vineyard Wind
Country	Scotland, UK	UK	Netherlands	Germany	U.S.A
Foundation type	Floating	Fixed bottom	Fixed bottom & floating	Fixed bottom	Fixed bottom
Total capacity	30 MW	1.2 GW	1.5 GW	913 MW	800 MW
Nominal output per turbine	6 MW	13 MW	8-9.5 MW	11 MW	13 MW
Distance from shore	22 km	131 km	24 km	70km	15 km
Depth	95-120 m	18-63 m	16-38 m	28-34 m	37-49 m
Safety Zone	500 m of construction works both in the turbine deployment area and along the export cable route. [27]	Rolling 500 m safety zones established around each wind farm structure and/or their foundations during construction. 50m safety zones established around any wind farm structure which is either partially completed or constructed but not yet commissioned. 500m safety zones around all 'major maintenance' being undertaken around a wind farm structure, as denoted by the presence of a major maintenance vessel. [28]	50 m distance to turbine poles and 500 distance of transformation stations, 500m safety zone around windfarm area. Closed to shipping through the wind farms; vessels with a length of up to 45 m may pass solely through the corridor. [29]	500 m around the wind farms, measured from the outer boundary. Navigation on shipping routes that are of importance to international shipping will not be affected by the safety zone. [30]	500 m from the center point of installations, temporarily during construction [31]

[27] Statoil (2015), "Hywind Scotland Pilot Park Project Environmental Statement" https://marine.gov.scot/sites/default/files/hywind.pdf

[28] BEIS (May 24, 2022), "Safety Zone Application – Dogger Bank A Offshore Wind Farm Decision Letter", https://assets.publishing.service.gov.uk/media/62ac59008fa8f5356fade931/dogger-bank-a-safety-zone-application-decision-letter-24052022.pdfFo

[29] Noordzeeloket "Code of conduct for safe passage through the Borssele Wind Farm Pass" https://www.noordzeeloket.nl

[30] BSH (2023), "Notices to Mariners: Official Maritime Publication", Volume 154, https://www2.bsh.de/daten/NFS/NfS2023/nfs-heft08-2023.pdf

[31] Coast Guard (2023) ,"Safety Zone; Vineyard Wind 1 Wind Farm Project Area, Outer Continental Shelf, Lease OCS-A 0501, Offshore Massachusetts, Atlantic Ocean" (Temporary final rule), https://www.federalregister.gov/documents/2023/06/30/2023-14073/safety-zone-vineyard-wind-1-wind-farm-project-area-outer-continental-shelf-lease-ocs-a-0501-offshore

Source: compiled by authors based on various sources

Note: Not all cases described are located in an EEZ.

2.1.4 Consideration of fishery rights

UNCLOS recognizes the sovereign rights of coastal States for the purpose of exploring and exploiting, conserving and managing fishery resources. Therefore, wind farms constructed in the EEZ should not give rise to any conflict with fisheries of other countries unless there are bilateral agreements in place. However, coordination with domestic stakeholders is likely to be challenging, as further elaborated in section 4.3.

2.2 Discussions in the Japanese government

In January 2023, the Cabinet Office compiled a report[32] by a group of experts focusing on six major aspects to be considered in relation to how they are defined under the United Nations Convention on the Law of the Sea (UNCLOS) and their consistency with domestic law, with a view to implementing offshore wind power generation in the EEZ. The main points of the report are summarized in Table 2-2.

32 Cabinet Office, (2023), "Report of the Working Group on Issues Related to International Law Pertaining to the Implementation of Offshore Wind Power in the Exclusive Economic Zone", January 31, 2023, https://www8.cao.go.jp/ocean/policies/energy/pdf/torimatome.pdf

TABLE 2-2 MAJOR CONCLUSIONS OF THE CABINET OFFICE WORKING GROUP

Item of consideration	Relevant UNCLOS articles *1	Relevant domestic laws	Conclusions
Legal status of offshore wind power facilities under international law	§56, §60, §91, §92	Ship Act; Electric Business Act	Given that the Ship Act (Law No. 46, 1906) does not define offshore wind power generation facilities as "ships," offshore wind power generation facilities installed in a given area for economic purposes should be considered to be "installations and structures" under UNCLOS.
Scope of sovereign rights and jurisdiction	§56, §60	Act on Exclusive Economic Zone and Continental Shelf	If the necessary procedures are stipulated under domestic law, a coastal State may permit, supervise, collect reports on, and conduct on-site inspections of exploration and development activities and occupancy of offshore wind farms during the construction, operation, and dismantling phases as part of exercising their sovereign rights and jurisdiction in the EEZ.
Setting safety zones	§60 (4)-(7)	Act on Establishment of Safety Zone Pertaining to Structures at Sea, etc.	A safety zone may be established around an offshore wind farm in the EEZ in accordance with the "Act on Establishment of Safety Zone Pertaining to Structures at Sea, etc." within an area not exceeding 500 meters from the outer edge of the offshore wind farm. Due notice shall be given on the extent of the safety zone
Reasonable consideration of the rights of other states: freedom of navigation and freedom to lay submarine electric cables and pipelines	§56, §58, §60, §79, §90	-	Freedom of navigation: it can be said that reasonable consideration has been given by notifying the location of the wind farm and extent of the safety zone when established, in addition to mapping the location on nautical charts. Freedom to lay submarine electric cables and pipelines: it would be appropriate to take measures such as keeping a certain distance between cables to prevent abrasion.
Environmental Impact Assessment	§1, §192, §194, §204, §205, §206	Electric Business Act; Environmental Impact Assessment Act	EIA should be implemented by taking the necessary domestic measures and applying domestic laws and regulation based on the "Law Concerning Exclusive Economic Zone and Continental Shelf", while taking into account discussions in the international community and national implementation by other countries. It should be noted that while the Electric Business Act holds the prefectural government responsible for EIA, there are no prefectural governments with jurisdiction over EEZs; and therefore, new regulations will need to be considered.
Requirement of prior notification and announcement to relevant countries	N.A.	N.A.	The government should appropriately determine whether or not prior notification is necessary as well as the scope of such notification, taking into consideration practices by other countries.

Source: Compiled by authors based on Cabinet Office (2023)

Notes:
*1 The subtitles of each article are as follows: Article 56: Rights, jurisdiction and duties of the coastal State in the exclusive economic zone; Article 1: Use of terms and scope; Article 58: Rights and duties of other States in the exclusive economic zone; Article 60: Artificial islands, installations and structures in the exclusive economic zone; Article 79: Submarine cables and pipelines on the continental shelf; Article 90: Right of Navigation; Article 192: General obligation; Article 194: Measures to prevent, reduce and control pollution of the marine environment; Article 204: Monitoring of the risks or effects of pollution; Article 205: Publication of reports; Article 206: Assessment of potential effects of activities

The Ministry of the Environment has also started to study the environmental impact assessment system for wind power generation, including ensuring environmental considerations in EEZs, in the Central Environment Council.

2.3 Conflict with other sectors

2.3.1 Potential conflict with fisheries in Japan

In Japan, offshore fishing in the EEZ is conducted with permits and licenses from prefectural governors or from the Minister of Agriculture, Forestry and Fishery as described in Table 2-3. The Act on the Exercise of Sovereign Rights in Relation to Fishing, etc. in the Exclusive Economic Zone regulates fishing by foreign vessels in Japan's EEZ. Bilateral fisheries agreements with Korea and China allow these neighboring countries to enter Japan's EEZ for fishery purposes.

TABLE 2-3 FISHERY CATEGORIES IN JAPAN

	Coastal fisheries	Offshore fisheries	Distant water fisheries
Sea area	Coastal areas	Coastal areas to 200 nautical miles (Approx. 370 km)	200 nautical miles to High Seas
Target species	Horse mackerel, mackerel, octopus, cuttlefish, shrimp, kelp, etc.	Mackerel, sardines, pacific saury, shrimp, crab, etc.	Tuna, bonito, cuttlefish, cod, etc.
Fishing methods	Diversity of local methods (Fixed net, small-scale bottom trawl fishing, drift net, gillnet, angling, etc.)	Offshore bottom trawl net, large to medium-sized drift net, nearshore single-line bonito fishing, etc.	Tuna longline fishing, trawl fishing, single-line bonito fishing, etc.
Duration	Mainly day trips	1 day – 1 month	50 days to 1 year
Characteristics	Accounts for more than 80% of fishermen in Japan	Use of 20～200 t vessels Accounts for more than half of nationwide catch.	20～30 ship crews
Licensing	Fishery right-based fisheries (Governor grants fishery cooperatives, individuals, or legal entities exclusive rights to conduct coastal fisheries or aquaculture)	Governor-licensed fisheries (Governor permits fisheries conducted in the offshore area off prefectural coasts)	Minister-licensed fisheries (Fishery conducted across several prefectures or in overseas waters)

Source: compiled by author based various materials

It is important to gain the understanding of different stakeholders when constructing wind farms in the EEZ or establishing safety zones around them. In Japan, the fisheries sector will be among the most important stakeholders, but target parties, often large private companies that operate in the target area are difficult to identify compared to fishery rights-based fisheries (coastal fisheries) where the Governor grants exclusive fishing rights mainly to local fishery cooperatives. Furthermore, the stakeholders are not always based in the coastal area close to the target sea area, but can be distributed across Japan, thus often not sharing the interests or visions of local stakeholders.

While it is difficult to identify the location of operations in minister-licensed fisheries (distant water fisheries) because of the vast area of operation not limited to offshore areas off the prefectural coasts, it is possible to acquire navigational data from fishing vessels because it is mandatory for them to be equipped with devices that can acquire navigational data and to keep these devices constantly in operation. On the other hand, operations for governor-licensed fisheries (offshore fisheries) are conducted in areas offshore the prefectural coast and thus do not cover as vast an area but are difficult to locate as many fishing vessels are not equipped with the aforementioned equipment.

2.3.2 Conflict with security interests

Wind turbines may interfere with radars because their large towers and rotating blades may reflect or obstruct electromagnetic waves. This could affect weather monitoring, forecasting and warning systems, military target tracking systems and aviation control. Therefore, careful consideration and consultation is called for when siting wind turbines. There are ongoing studies on how to mitigate such impacts.

In Japan, a large portion of its EEZ borders critical national security waters of South Korea and China, which may limit access for wind power operators.

2.3.3 Approaches taken in other countries

In all countries, national security or military use is a national interest that is prioritized over other uses, but countries take different approaches towards fisheries, as provided in Table 2-4.

TABLE 2-4 RULES FOR FISHERIES IN WIND FARM AREAS IN SELECTED COUNTRIES

	Scotland	UK	Netherlands	Germany	U.S.A.
Rules for fisheries	Existing fishing sites are safeguarded if possible. In the pre-commission phase and 20-year operational phase of the Project, fisheries are restricted from the 7.5 km^2 occupied by the turbines and their mooring system	Fishing is given priority.	Fishing has access to all areas, but national interest activities have priority.	Interference with fisheries shall be avoided as much as possible	Fishing is not restricted within windfarms.
Examples of major commercial fisheries	Turbine deployment area: Norway lobster, squid, scallop dredging (export cable corridor Export cable corridor: scallop dredging, crab and lobster (creels), mackerel (hand lining)	Various fisheries, with vessels registered in the UK, Denmark and the Netherlands accounting for 93% of surveillance sightings between 2002 and 2011[33].	Cutter fishing, shrimp fishing, gillnet fishing	Cod, flatfish, saithe, North Sea crab	Lobster, crab, black sea bass, etc.

Source: compiled by author based various materials

In the UK, the Dogger Bank Wind Farm, keeps mariners informed, providing weekly notices of operations and notices on their website[34]. While fishing is not restricted within wind farms in the UK, studies have found that fishing activity within offshore wind farm (OWF) boundaries has changed, primarily because fishermen are fearful of fishing gear becoming entrapped by seabed obstacles such as cables. However, fishing was found to co-exist with offshore wind farms by some fishermen who operated demersal trawl gear in cable-free corridors.[35] This kind of experience could be extended to other fishermen.

[33] Brown & May Marine (2014), "Environmental Statement Chapter 15 Appendix A Commercial Fisheries Technical Report" https://doggerbank.com/wp-content/uploads/2021/11/ES-Chapter-15-Appendix-A-Commercial-Fisheries-Technical-Report_Part1.pdf

[34] Dogger Bank Wind Farm website "Mariners and fisheries" https://doggerbank.com/mariners-fisheries/

[35] Gray, M., Stromberg, PL., Rodmell, D., (2016) ,"Changes to fishing practices around the UK as a result of the development of offshore windfarms – Phase I (Revised)" Crown Estate, https://www.thecrownestate.co.uk/media/2600/final-published-ow-fishing-revised-aug-2016-clean.pdf

Information on fisheries is not included on the spatial development strategy map of the Netherlands' "North Sea Programme 2022-2027"[36], as in principle, fisheries have access to all areas of the Dutch part of the North Sea, except where there are restrictive measures, such as safety zones, in place. The Dutch maritime spatial plan seeks to explore co-use of the limited sea area. It notes that the space available for certain fishing methods like trawl fishing will continue to decrease as a result of the expansion of nature conservation areas and wind farms. The transition to sustainable fishing practices, including a shift to aquaculture and passive fishing, is also listed as a national interest. Yet, there is limited space available for passive fishing activities in a wind farm zone; and therefore, spaces are allocated through registration.

Salerno et al (2019) points out that while experiences in countries like the U.K. and the Netherlands have proven that fishing with fixed gear, such as pots, within offshore wind farms do not pose significant challenges and commercial fishing has thus successfully continued, it can be difficult to use the European experience to predict the effects that offshore wind farms may have on other fisheries. This is due to variations in fish species and fishing methods (as presented in Table 2-4), as well as the size and geographic expanse of fishing vessels.

Wind turbine arrays can be arranged to accommodate different fisheries, but this could compromise the cost efficiency of a wind farm. An example is the decision made by the U.S. Bureau of Ocean Energy Management (BOEM) in 2021 to permit Vineyard Wind – a grid layout of 62 turbines spaces at 1-nautical mile (nm) intervals. The original plan had 0.9-nm intervals, but commercial fishermen had advocated the inclusion of 4-nm-wide vessel transit lanes to ensure safe navigation and to enable the use of certain types of fishing gear[37]. BOEM pointed out that vessel transit lanes would increase congestion and reduce the economic benefits of the windfarm. The project remains exposed to four lawsuits arguing that the BOEM failed to adequately evaluate the project's potential impact of local fishermen and marine mammals[38].

The variation of fish species and fishing methods, differences in diets and the economic dependence on fisheries, among other factors make it difficult for countries to take a common approach to fisheries. Therefore, countries need to find solutions tailored to their circumstances. It is also crucial to explore ways to co-use the limited maritime space with wide stakeholder participation, as discussed in the following subsections.

2.4 Maritime Spatial Planning

Maritime Spatial Planning (MSP) is a public process of allocating the use of marine areas, balancing demands for development with the need to protect the environment. It brings together multiple users of the ocean to make informed and coordinated decisions about how to rationally use marine resources in an efficient, safe, and sustainable way.

Some countries have been engaged in maritime spatial planning for more than a decade. The UK[39] and Scotland[40] provide frameworks for formulating Marine Plans that extend to the EEZ and taking decisions affecting the marine environment that support multiuse of marine space, including commercial fisheries. In Europe, the EU Directive for maritime spatial planning (2014/89/EU) obliges all EU coastal states to establish maritime spatial planning plans by 2021. The maritime spatial plans of Germany and the Netherlands extend to the EEZ. With many projects in the EEZ already in the pipeline, these examples provide good reference for Japan.

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[36] Government of the Netherlands (2022), *North Sea Programme 2022-2027,* https://www.noordzeeloket.nl/publish/pages/201299/north-sea-programme-2022-2027.pdf

[37] National Fisherman (May 18, 2021) "Vineyard Wind decision shows questions remain of economic, environmental impact," https://www.nationalfisherman.com/northeast/vineyard-wind-decision-shows-questions-remain-of-economic-environmental-impact

[38] Kaitlyn Vu (2023), "Turbines in Trouble: The Controversy Behind Vineyard Wind & Offshore Wind in Massachusetts" Harvard Political Review, https://harvardpolitics.com/turbines-in-trouble/

[39] UK Parliament (2011), The UK Marine Policy Statement

[40] Scottish Government, (2015), Scotland's National Marine Plan (Edinburgh)

2.4.1 UK

The Marine and Coastal Access Act 2009 (Parliament of the United Kingdom, 2009) introduces spatial planning for the British marine area, which includes the territorial seas and offshore area adjacent to the UK, the area of sea designated as the UK EEZ the continental shelf. The Fishery Limits Act (Parliament of the United Kingdom, 1976) identifies fishing areas currently extending to 200 nm from the baseline.

UK has also established a Renewable Energy Zone (REZ) under the Energy Act 2004 beyond the limits of the UK territorial sea, in which the UK can exercise rights over the production of energy from water or winds. The REZ is similar in function and extent to an EEZ. UK criminal and civil law are also applicable to the REZ, where the UK Government issues licenses to wind farm developers, etc.

2.4.2 Germany

Germany formulated the Spatial Plan for the German Exclusive Economic Zone in the North Sea and Baltic Sea in 2009 (and last amended it in 2021). Its legal basis is the Federal Spatiall Planning Act (ROG), which was extended to the EEZ in 2004 (and last amended in 2017). The new plan coordinates the various uses in the EEZ, comprising shipping, offshore wind energy, cables, pipelines, raw material extraction, fisheries, research and defense. It reserves areas for individual uses, thus helping to minimize conflicts.

The areas and sites designated In the 2021 Maritime Spatial Plan as priority and reservation areas for offshore wind energy are said to be able to accommodate a total of 43 GW of offshore wind turbines, sufficiently covering the target of reaching 40 GW in 2035.[41] As of December 2021, Germany had 27 wind farms in the EEZ in operation, under construction or in preparation, collectively amounting to a total capacity of totaling around 8.87GW. Twenty of these wind farms are located in a priority zone designated in its maritime spatial plan. In the designated priority areas for wind energy, the extraction of wind energy is given priority over all other spatially uses. The interests of fishing and defense are to be taken into account in the planning, with co-use as a possibility for a better balance of interests.

2.4.3 Netherlands

The Netherlands adopted its first Maritime Spatial Plan, the North Sea Policy Document in 2009. The North Sea Programme 2022-2027[42] is the Netherlands' third maritime spatial plan, covering the Netherlands' territorial sea and EEZ. Seeking to achieve the right social balance in the spatial development of the North Sea, program describes the policy for strengthening the ecosystem, the transition to sustainable food supply, the transition to sustainable energy provision, maritime transport, and a sustainable blue economy. The North Sea Programme 2022-2027 describes newly designated offshore wind farm zones and "search areas" to be considered for wind energy beyond 2030, collectively amounting to 34 GW.

2.5 Public participation in marine policy development

In many European countries, it is becoming common practice to develop policies based on wide public participation to obtain public understanding through open discussion and maritime spatial planning is not an exception. The marine spatial plans mentioned above are outcomes of participatory processes. Many overseas participatory processes engaging a wider range of stakeholders have successfully resulted in policies based on wide consensus.

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[41] BSH (2023) "Maritime spatial-relevant developments in the German Exclusive Economic Zone in the North Sea and the Baltic Sea: Annual Report 2021"
https://www.bsh.de/EN/TOPICS/Offshore/Maritime_spatial_planning/_Anlagen/Downloads/Jahresbericht_AWZ_2021_EN.pdf

[42] Government of the Netherlands (2022), *op. cit.*

In Japan, after the government designates a "promising zone," a council is established for consultation among relevant parties and facilitation of local coordination. This is not as extensive a process as many practices in Europe. The following subsections offer an overview of participatory processes supporting maritime spatial planning in selected European countries and some insight in the lessons learned in the context of decision-making in marine spatial planning in Japan.

2.5.1 UK

In the UK, a Marine Plan is formulated following a 12-step process with stakeholder engagement during each step (Figure 2-1).

FIGURE 2-1 MARINE PLANNING PROCESS IN THE UK

Source: adapted by authors based on GOV.UK website[43]

A Statement of Public Participation (SPP) is required for each marine plan area under the Marine and Coastal Access Act 2009. It helps ensure that the marine planning process is transparent, and that stakeholders understand how they can be involved and can influence a marine plan's development. All draft SPPs are subject to public consultation before they are submitted to the Secretary of State for approval to publish, after which the marine planning process is formally commenced in the relevant marine plan area. Different channels, such as meetings, bespoke workshops, consultation events, stakeholder events, digital tools (social media, webinar, websites, videos and animations, blogs, etc.) and direct access (consultations, email, newsletters, questionnaires, etc.). The stakeholders engaged include not only different interest groups but also bordering nations and administrations, coastal partnerships, delivery partners, local communities, the general public, government departments, industry representative groups, local and other public authorities, and non-governmental organizations.

2.5.2 Germany

Germany's Maritime Spatial Plan 2021 came into force after an extensive revision process pursuant to Section 9 Paragraph 1 of the Federal Spatial Planning Act (ROG). In the initial stage, public authorities were given the opportunity to provide information on any plans and measures they intended to take in the EEZ or had already taken, as well as on the time schedule for their implementation. Then, following various thematic

[43] Marine Management Organization (June 11, 2014), "Guidance: Marine planning and development" https://www.gov.uk/guidance/marine-plans-development#agree-how-and-when-interested-people-will-be-involved

workshops and expert discussions conducted by BSH (German Federal Maritime and Hydrographic Agency) on shipping, nature conservation, fisheries, underwater cultural heritage, defense and raw material extraction, national and international consultations were held. (Figure 2-2)

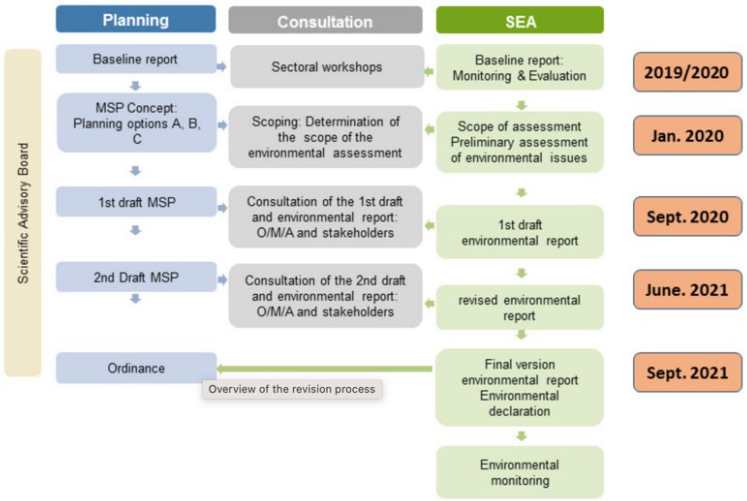

FIGURE 2-2 REVISION PROCESS OF THE MARITIME SPATIAL PLAN

Source: BSH website[44]

2.5.3 Netherlands

Numerous civil society organizers called upon the national government to formulate a joint North Sea Agreement, a set of Agreements between the Dutch government and stakeholders through to 2030 with a future vision on the development of wind energy in the long term. The North Sea Consultation (NZO) was established by the Physical Environment Consultative Council (OFL), and the Agreement was signed in June 2020. The document includes agreements on the designation and protection of areas, the designation of wind farm zones, the plotting and combined use of wind farms, additional nature areas, fishery in marine nature areas, installations and objects, and oil and gas production. Although the NZO attempted to take all stakeholder considerations into account, it remains unsigned by the Dutch Fishermen's Association and VissNed, a producer organization. Based on the North Sea Agreement, the NZO has formally been launched in 2021 as a permanent consultative body of stakeholders with seats kept open for these fisheries representatives.

Hatenboer, et. al (2023) points out that division within the fisheries sector, among different fisheries organizations, over modes of interest representation made it unable to ratify the North Sea Agreement. Widely differing views existed about the maximum number of closed areas that could be accepted as well as about the fleet transition and decommissioning scheme. Support for an agreement by sectoral leaders does not always represent the majority of members but this is often not visible from the outside. This challenge could be faced in Japan where discussions are often conducted among high-level stakeholder representatives.

[44] BSH website "Maritime Spatial Plan 2021"
https://www.bsh.de/EN/TOPICS/Offshore/Maritime_spatial_planning/Maritime_Spatial_Plan_2021/maritime-spatial-plan-2021_node.html

3 Stakeholder engagement for offshore wind power development in the EEZ

Given that UNCLOS acknowledges that coastal States may exercise sovereign rights in the EEZs over exploration, exploitation, conservation, and management of natural resources and other economic activities, such as the production of wind or tidal power, many countries like Germany and the UK have developed maritime spatial plans, which include areas designated for offshore wind power. Given that all States enjoy the right of navigation and overflight and the laying of submarine cables and pipelines within any EEZ; and therefore, it is important for Japan to announce its intentions to construct wind power farms in its EEZ. This can be done by formulating a maritime spatial plan based on both scientific data and stakeholder engagement. Yet, given that maritime spatial planning will require time, it will also be essential for the government to promote and announce early project development by formulating a concrete roadmap to achieve its offshore wind power deployment targets.

Negotiations with stakeholders, including not only Japanese fishermen but also parties of bilateral fishery agreements should be initiated promptly. Today, the Japanese government designates Promotion Zones, Promising Zones and Preparation Zones for offshore wind power based on discussions with local stakeholders, often representatives of local interest groups. Individual negotiations are often conducted by the project developer, as contribution to the local economy is included in the evaluation criteria. However, stakeholders will be difficult to identify in the EEZ and negotiations are likely to become more challenging.

The engagement of a wide range of stakeholders in designing these plans is important to ensure fairness and for parties to foster a sense of ownership for not only the plan itself but for individual projects. The lessons learned in the Netherlands are an example of the consequences to be faced when there is an internal conflict of views within a stakeholder group. It demonstrates the significance of not limiting coordination activities to the top level and ensuring stakeholder dialogue at all levels.

Japan lacks a participatory process for decision-making that is required by law in many countries. Open discussions supported by science-based information will make outcomes more acceptable across different parties. Maritime spatial planning will require consultations with and consensus among a wide range of stakeholders, including the fishing community, local people and businesses in the coastal areas, and neighboring countries and regions. There is an urgent need for a participatory decision-making process to be developed in Japan. Such processes should ideally be led by a government organization that can cover inter-ministerial topics, such as the Cabinet Office or a newly established organization dedicated to participatory processes.

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