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The Legal Framework for Offshore Carbon Capture and Storage in Canada

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SABIN CENTER FOR CLIMATE CHANGE LAW

THE LEGAL FRAMEWORK FOR OFFSHORE CARBON CAPTURE AND STORAGE IN CANADA

By Romany M. Webb & Michael B. Gerrard

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The Sabin Center for Climate Change Law develops legal techniques to fight climate change, trains law students and lawyers in their use, and provides the legal profession and the public with up-to-date resources on key topics in climate law and regulation. It works closely with the scientists at Columbia University's Earth Institute and with a wide range of governmental, non-governmental and academic organizations.

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This paper was developed for the Solid Carbon research project—a Pacific Institute for Climate Solutions ("PICS") feasibility study led by Ocean Networks Canada, a University of Victoria initiative. Information about the Solid Carbon project, and its international team of researchers, is available on the PICS website.

This paper is an academic study and is not intended to provide legal advice. Lawyers in Canada should be consulted for legal advice on the laws of Canada.

EXECUTIVE SUMMARY

Averting catastrophic climate change requires immediate action to prevent additional carbon dioxide and other greenhouse gases being released into the atmosphere. However, even that may not be sufficient, with many scientists now warning that it will likely also be necessary to reduce the existing atmospheric carbon dioxide load. That could be achieved using negative emissions technologies that remove carbon dioxide from the atmosphere and store or utilize it in some way. One promising technology is direct air capture ("DAC") which uses liquid chemical solutions or solid sorbent filters to capture carbon dioxide from the air and concentrate it into a pure stream.

Current DAC technologies are highly energy intensive and must be powered by renewable energy sources to achieve negative emissions. Ideally, DAC equipment would be co-located with a renewable energy facility, at a site where carbon dioxide can be stored or used. There is growing interest in the possibility of locating systems offshore in areas with high wind energy capacity and sub-seabed geologic formations that are suitable for storing carbon dioxide. One possible site off the west coast of Canada—known as the Cascadia Basin—is currently being explored in a Pacific Institute for Climate Solutions ("PICS") study, called Solid Carbon. This paper was developed as part of that study. It provides a comprehensive analysis of legal issues associated with deploying an offshore DAC system, powered by offshore wind turbines, in Canadian waters and storing the captured carbon dioxide in sub-seabed rock formations.

There is there is no single, comprehensive legal framework for offshore carbon capture and storage in Canadian waters. Each component of the carbon capture and storage system will, therefore, be regulated separately. The components may be subject to multiple, overlapping regulatory frameworks, some of which are relatively new and untested, leading to significant uncertainty as to how they will apply. It will, therefore, be important for developers to engage with regulatory agencies early in the project development process.

Table 1 below lists the key regulatory approvals required for offshore carbon capture and storage projects (by project component and location). As indicated there, various federal permits or other approvals must be obtained prior to the installation of offshore wind turbines, platforms,

and pipelines, and the injection of carbon dioxide. Moreover, use of the seabed for those activities would require a license from the federal government, which controls the submerged land underlying Canadian waters. There is considerable uncertainty as to whether the federal government is authorized, under existing law, to grant licenses for use of the seabed for offshore carbon capture and storage. New legislation may be needed to facilitate licensing. The various government agencies responsible for issuing licenses, permits, and other approvals required for offshore carbon capture and storage will also likely need to develop new regulations and guidance documents on the process therefor. Where possible, project developers should participate in relevant regulatory proceedings and agency consultations regarding carbon capture and storage, and advocate for a regulatory framework that facilitates offshore approaches.

Table 1: Required Approvals (by Project Component and Location)

Project Component*	Location**	Approvals Needed	Responsible Government Agency	Notes
Wind energy facility	Territorial sea	Seabed license (if turbines are anchored to the seabed)	Natural Resources Canada ("NRCan")	No statute expressly authorizes the grant of seabed licenses for renewable energy projects. NRCan has suggested that licenses may be issued under the Federal Real Property and Federal Immovables Act ("FRPFIA") but that is uncertain. New legislation may be needed.
		Approval under the Canadian Energy Regulator Act ("CERA")	Canadian Energy Regulator ("CER")	No approvals can be issued until regulations are adopted under the CERA (expected in 2023). Depending on the number of turbines constructed, an impact assessment may be required prior to approval by CER.
		Permit under the Canadian Navigable Waters Act ("CNWA")	Transport Canada	There is an established process for issuing permits under the CNWA. Any permit issued is likely to be conditioned on the installation of warning devices to alert vessels to the presence of the turbines.
	Exclusive economic zone ("EEZ") / Continental shelf	Seabed license (if turbines are anchored to the seabed)	NRCan	No statute expressly authorizes the grant of seabed licenses for renewable energy projects. Licenses cannot be issued under the FRPFIA for use of the continental shelf (i.e., as opposed to submerged land underlying the territorial sea). New legislation may be needed.
		Approval under the CERA	CER	No approvals can be issued until regulations are adopted under the CERA (expected in 2023). Depending on the number of turbines constructed, an impact assessment may be required prior to approval by CER.
DAC facility	Territorial sea	Seabed license (if platform is anchored to the seabed)	NRCan	No statute expressly authorizes the grant of seabed licenses for offshore DAC platforms. NRCan has suggested that licenses may be issued under the FRPFIA but that is uncertain. New legislation may be needed.
		Permit under the CNWA	Transport Canada	There is an established process for issuing permits under the CNWA. Any permit issued is likely to be conditioned on the installation of warning devices to alert vessels to the presence of the platform.

Project Component*	Location**	Approvals Needed	Responsible Government Agency	Notes
	EEZ / Continental shelf	Seabed license (if platform is anchored to the seabed)	NRCan	No statute expressly authorizes the grant of seabed licenses for offshore DAC platforms. Licenses cannot be issued under the FRPFIA for use of the continental shelf. New legislation may be needed.
Carbon dioxide pipeline	Territorial sea	Seabed license	NRCan	No statute expressly authorizes the grant of seabed licenses for carbon dioxide pipelines. NRCan has suggested licenses may be issued under the FRPFIA but that is uncertain. New legislation may be needed.
		Certification under the CERA	CER	There is an established process for pipeline certification. Depending on the size of the pipeline and where it is located, an impact assessment may be required prior to certification.
	EEZ / Continental shelf	Seabed license	NRCan	No statute expressly authorizes the grant of seabed licenses for carbon dioxide pipelines. Licenses cannot be issued under the FRPFIA for use of the continental shelf. New legislation may be needed.
		Certification under the CERA	CER	There is an established process for pipeline certification. Depending on the size of the pipeline and where it is located, an impact assessment may be required prior to certification.
Carbon dioxide injection operation	EEZ / Continental shelf	Seabed license	NRCan	No statute expressly authorizes the grant of seabed licenses for carbon dioxide injection operations. Licenses cannot be issued under the FRPFIA for use of the continental shelf. New legislation may be needed.
		Permit under the Canadian Environmental Protection Act ("CEPA")	Environment and Climate Change Canada	Permits cannot be issued for the sub-seabed injection of carbon dioxide. The CEPA must be amended to permit carbon dioxide injection.

Notes:
* See Part 2 below for a full description of the Solid Carbon Project.
** The "territorial sea" refers to the waters and submerged land extending twelve nautical miles from the coast. The "EEZ" refers to the waters extending twelve to 200 nautical miles from the coast. The "continental shelf" refers to the submerged lands underlying the EEZ (and, in some cases, extending beyond it). See Part 3 below for a full explanation.

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1. INTRODUCTION

More than five years after the adoption of the Paris Agreement, the international community is still not on track to achieve its goal of keeping global average temperatures "well below" 2°C above pre-industrial levels, and ideally to 1.5°C above pre-industrial levels.[1] On the contrary, the United Nations Environmental Programme ("UNEP") has warned that temperature increases of more than 3°C are likely by 2100 if current greenhouse gas emissions trends continue.[2] Time is running out to correct course. According to UNEP, unless greenhouse gas emissions are "significantly reduced" by 2030, it will be virtually "impossible to keep global warming below 1.5°C."[3] Significant emissions reductions are needed by 2050 to limit warming to 2°C.[4]

Modelling by the Intergovernmental Panel on Climate Change ("IPCC") indicates that, to keep the increase in global average temperatures within 1.5 to 2°C, greenhouse gas emissions must reach net zero by mid-century or shortly thereafter.[5] That will likely require the use of negative emission technologies that can remove greenhouse gases from the atmosphere to offset residual emissions from hard-to-eliminate sources (e.g., heavy industry).[6] Indeed, all of the emissions pathways identified by the IPCC as consistent with limiting warming to 1.5°C assume the use of negative emission technologies,[7] as do a large proportion of the IPCC's 2°C-consistent

[1] Paris Agreement, Dec. 12, 2015, Art. 2(1)(a).

[2] UN Env't Programme, Emissions Gap Report 2020 XXI (2020), https://perma.cc/6G97-9X68.

[3] *Id*. *See also* Myles Allen et al., *Summary for Policymakers in* GLOBAL WARMING OF 1.5°C: AN IPCC SPECIAL REPORT (V. Masson-Delmotte et al. eds., 2018).

[4] *See e.g.*, OTTMAR EDENHOFFER ET AL., CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT BY THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2014), http://perma.cc/T8J5-MBTA

[5] *Id*. *See also* Allen et al, *supra* note 2.

[6] UN Env't Programme, *supra* note 2, at 33-34.

[7] Allen et al., *supra* note 2, at 17.

pathways.[8] The extent to which negative emission technologies will have to be used depends, in large part, on whether countries successfully reduce their greenhouse gas emissions in the short-term at the necessary pace. Few, if any, countries are currently doing so and thus more greenhouse gases will likely need to be removed from the atmosphere in the future to compensate for past emissions.[9]

One negative emission technology that is receiving increasing attention is direct air capture ("DAC"). Current DAC technologies use liquid chemical solutions or solid sorbent filters to remove carbon dioxide from the ambient air and concentrate it into a pure stream that can either be permanently stored in underground geologic formations or utilized, ideally in a manner that does not result in its re-release back to the atmosphere.[10] Because DAC is energy intensive and must be powered by zero- or low-carbon sources to achieve negative emissions, facilities would likely be co-located with wind, solar, or other renewable generating plants. To minimize transportation costs, the integrated system would ideally be located at, or close to, the site where the carbon dioxide will be stored or used. There is growing interest in the possibility of locating systems offshore in areas with high wind energy capacity and sub-seabed geologic formations suitable for storing carbon dioxide.

The Solid Carbon project aims to assess the feasibility of deploying an integrated negative emission system, using DAC powered by offshore wind turbines, in the Cascadia Basin off the west coast of Canada.[11] Initial research suggests that the Cascadia Basin is well suited for carbon storage because the sub-seabed is comprised of basalt, a type of rock that has been shown to react

[8] Edenhoffer et al., *supra* note 4, at 12.

[9] UN Env't Programme, *supra* note 2, at 33-34.

[10] *See generally*, International Energy Agency, *Direct Air Capture*, https://perma.cc/EJN5-TK75 (last visited Jan. 14, 2021).

[11] *See* Pacific Institute for Climate Solutions, *Solid Carbon: A Negative Emissions Technology Feasibility Study*, https://perma.cc/CR89-74LJ (last visited Jan. 14, 2021).

with carbon dioxide to form carbonate minerals.[12] During this process, the injected carbon dioxide is permanently converted into a solid and thus becomes immobile, greatly reducing the potential for leakage.[13]

As part of the Solid Carbon project, we analyzed the legal requirements for deploying an offshore negative emissions system, using DAC powered by wind turbines, and injecting the captured carbon dioxide into sub-seabed basalt rock formations in the Cascadia Basin. To inform the analysis, we consulted with relevant Canadian government agencies, including the Canadian Energy Regulatory ("CER"), Environment and Climate Change Canada ("ECCC"), Natural Resources Canada ("NRCan"), and Transport Canada. This paper draws on discussions with representatives of those agencies, as well other research into the applicable legal frameworks. (The authors of this report are U.S. lawyers not admitted to practice in Canada. Canadian lawyers should be retained to assist with obtaining any necessary regulatory approvals and to provide legal advice on Canadian law.)

Canada does not currently have a dedicated legal framework for offshore carbon capture and storage. There are, however, a number of Canadian laws that could apply to the various components of an offshore carbon capture and storage project (i.e., the renewable energy facility, DAC facility, carbon dioxide pipeline, and carbon dioxide injection operation). When and how those laws apply will depend on the specifics of each project, including precisely where it occurs. This paper discusses the key laws that could apply to projects off the west coast of British Columbia in the Canadian territorial sea or EEZ.

The remainder of this paper is structured as follows: background information about the Solid Carbon project is provided in Part 2. Part 3 then discusses key principles of international law governing countries jurisdiction over offshore areas and their application in Canada. Key

[12] *See generally*, David S. Goldberg et al., *Carbon Dioxide Sequestration in Deep-Sea Basalt*, 105 PNAS 9920 (2018). Basalt rock formations can also be found onshore. Carbon dioxide is currently being stored in one onshore basalt formation in Iceland. *See* Carbfix, *How it works*, TECHNOLOGY, https://perma.cc/SV9C-DQHT (last visited Jan. 25, 2021).

[13] Sigurdur R. Gislason & Eric H. Oelkers, *Carbon Storage in Basalt*, 344 SCIENCE 373, 374 (2014).

issues relating to use of the seabed under Canadian jurisdiction for the Solid Carbon project are discussed in Part 4. Part 5 then identifies additional permits and other approvals required for various components of the Solid Carbon project. Part 6 concludes.

2. PROJECT OVERVIEW AND ASSUMPTIONS

The Pacific Institute for Climate Solutions has provided funding and research partnership support for the "Solid Carbon" project, which aims to develop an integrated negative emissions system off the west coast of British Columbia, Canada. The system would use DAC technology to remove carbon dioxide from the ambient air and inject it into sub-seabed rock formations. The target injection site is the Cascadia basin, which straddles the U.S. / Canadian border,

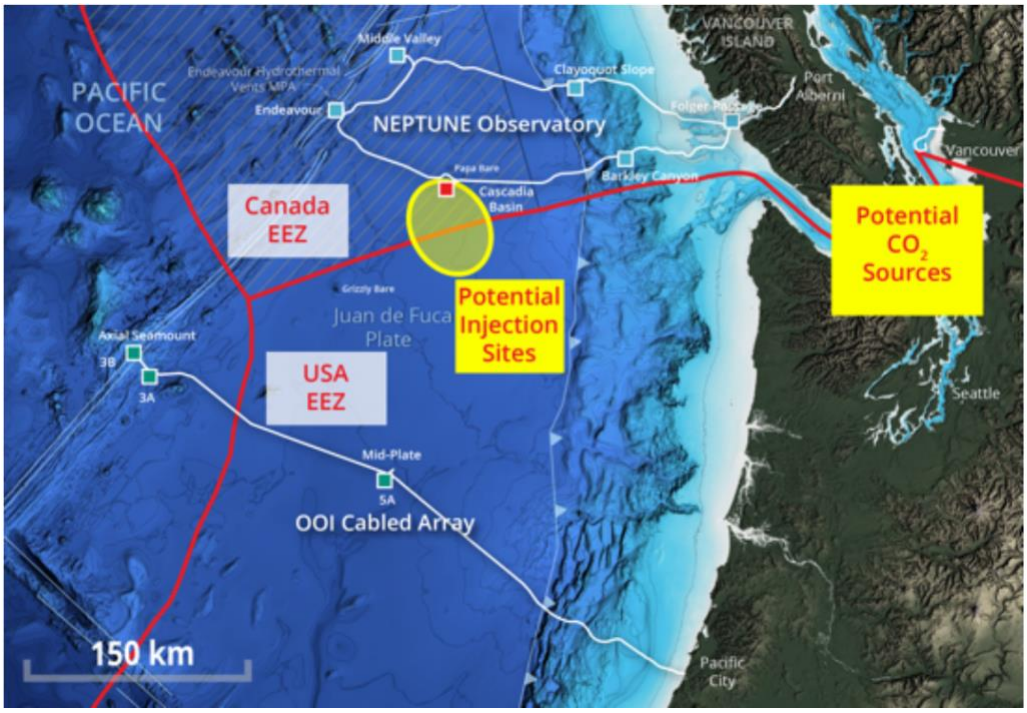

Figure 1: Location of the Cascadia Basin[14]

[14] David Goldberg et al., *EOS Trans. AGU, Fall Meeting, PA43B-3210, Poster # PA43B-1367* (Washington D.C., Dec. 13-17, 2018).

approximately 100 miles (160 kilometers) from the west coast (see Figure 1). The sub-seabed of the Cascadia basin is comprised of basalt rock formations, wherein carbon dioxide could be injected and would transform into solid carbonate minerals, enabling long-term storage with minimal risk of leakage.

The Solid Carbon project is assessing the feasibility of capturing and storing approximately 0.6 million metric tons of carbon dioxide each year in the Canadian portion of the Cascadia Basin.[15] For the purposes of this analyses, we assume that all activities related to the Solid Carbon project will take place in Canadian waters, west of Haida Gwaii and Vancouver Island.

Capturing 0.6 million metric tons of carbon dioxide would require use of a DAC facility comprising six to ten air contactor units, which would be housed on an offshore floating platform measuring approximately 27,000 square feet (2,500 square meters). The DAC facility would be powered by offshore wind turbines, with initial work indicating that up to 100 turbines, spread across up to eighty-six square miles (223 square kilometers), may be required. Each turbine would be mounted on a floating structure anchored to the seabed and linked to the rest of the array and the DAC facility via dynamic (i.e., moving) cables in the water. The captured carbon dioxide would be transported from the DAC platform to the injection site via pipeline. At the injection site, wells will be drilled into the seabed and the carbon dioxide injected, either as a supercritical liquid or a gas dissolved in water.

[15] This is consistent with the British Columbia government's goal of facilitating "safe and effective underground . . . storage" of 0.6 million metric tons of carbon dioxide annually by 2030. *See* BRITISH COLUMBIA GOVERNMENT, CLEAN BC: OUR NATURE. OUR POWER. OUR FUTURE 9 (2019), https://perma.cc/8FNT-EH3U. This paper focuses on legal issues associated with a commercial-scale operation, capturing approximately 0.6 million metric tons of carbon dioxide annually, and does not discuss a potential demonstration project.

3. JURISDICTION OVER OFFSHORE AREAS

3.1 Applicable International Law

Under international law, as set out in the United Nations Convention on the Law of the Sea ("UNCLOS"), each coastal state has jurisdiction over areas within 200 nautical miles of the low water line along its coast (the "baseline"[16]) and further in some circumstances.[17] The 200 nautical mile zone is generally divided into three key parts (see **Figure 2**), each of which has a different legal status as follows:

- The ***territorial sea***, which comprises the waters and submerged land extending twelve nautical miles from the baseline, and forms part of the sovereign territory of the country.[18]
- The ***exclusive economic zone*** ("EEZ"), which comprises the waters situated beyond the territorial sea, up to 200 nautical miles from the baseline.[19] Within the EEZ, the coastal state has sovereign rights to explore, exploit, conserve, and manage natural resources and undertake other activities for the economic exploitation of the zone, among other things.[20]
- The ***continental shelf***, which comprises the submerged land extending beyond the territorial sea to the farthest of 200 nautical miles from the baseline or the outer edge of the continental margin,[21] up to sixty nautical miles from the foot of the continental slope or the point where

[16] The baseline may differ from the low water line due to geological factors, such as the nature of the coastline and/or the presence of reefs thereon. For example, in the area around Vancouver Island on Canada's west coast, straight baselines are used. Straight baselines are determined by drawing a straight line joining points along indented coastlines and/or the border of islands along the coast. *See* Fisheries and Oceans Canada, *Baselines of the Territorial Sea*, HYDROGRAPHY, https://perma.cc/2R32-AFKT (last updated Nov. 26, 2018).

[17] United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

[18] *Id*. at Art. 2-3.

[19] *Id*. at Art. 55 & 57.

[20] *Id*. at Art. 56.

[21] The "continental margin" refers to the submerged prolongation of the land mass of the coastal state. *See id*. at Art. 76(1).

sediment thickness is one percent of the distance thereto.[22] Each coastal state has sovereign rights over its continental shelf for the purpose of exploring and exploiting natural resources.[23]

Except as noted above, coastal states generally do not have jurisdiction over areas more than 200 nautical miles from shore, which form part of the high seas.[24] UNCLOS provides for "freedom of the high seas," which is defined to include, "for both coastal and land-locked states: (a) freedom of navigation; freedom of overflight; freedom to lay submarine cables and pipelines . . . ; freedom to construct artificial islands and other installations . . . ; freedom of fishing . . . ; [and] (f) freedom of scientific research."[25]

3.2 Canadian Jurisdictional Areas

Consistent with UNCLOS, Canada has claimed jurisdiction over offshore waters, extending 200 nautical miles from the baseline.[26] The Canadian Oceans Act defines the baseline as the "low-water line along the coast or on a low-tide elevation," being a "naturally formed area of land that is surrounded by and above water at low tide but submerged at high tide."[27] Waters situated landward of the baseline are considered part of Canada's "internal waters" and subject

[22] *Id*. at Art. 76(5). The continental shelf cannot extend more than 100 nautical miles from the 2,500 meter isobath or 350 nautical miles from the baseline. *See id*.

[23] *Id*. at Art. 77.

[24] *Id*. at Art. 86-87. The seabed underlying the high seas and the resources therein are considered "the common heritage of mankind." Their development is overseen by the International Seabed Authority, which must act on behalf of, and for the benefit of, mankind as a whole. *See id*. at Art. 136-137, 140 & 150.

[25] *Id*. at Art. 87.

[26] Oceans Act, S.C. 1996, c. 31, § 13(1).

[27] *Id*. § 5(1) & (4). The Act provides for the adoption of regulations specifying a different baseline. *See id*. § 5(1), (4). Such regulations have been adopted with respect to the west coast of Canada where the coastline is heavily indented by bays and harbors. The regulations provide for the use of "straight baselines" that are determined by drawing "closing lines" between points on either side of the indents. *See* Territorial Sea Geographical Coordinates Order, C.R.C., c. 1550.

to the absolute sovereignty of the relevant provincial government.[28] However, the provinces do not have any sovereign rights with respect to waters located seaward of the baseline, which fall under the exclusive authority of the federal government.[29] The federal government also exercises authority over offshore land, comprising the seabed and subsoil underlying the territorial sea and EEZ to the farthest of 200 nautical miles from the baseline, or the outer edge of the continental margin.[30]

Off the coast of British Columbia, the baseline is located on the west side of Vancouver Island. The waters and submerged lands between Vancouver Island and the lower mainland form part of the internal waters of Canada and thus fall under the exclusive authority of the provincial government of British Columbia.[31] Authority over areas further north, between Haida Gwaii and the mainland, is disputed.[32] The provincial government, federal government, and Indigenous peoples have all claimed authority over the area and, in practice, share management of it.[33] The federal government has sole, undisputed authority over areas west of Vancouver Island and Haida Gwaii, where all activities related to the Solid Carbon project are expected to occur.

[28] Oceans Act, §§ 6 & 9.

[29] *Id*. § 14. *See also* Reference Re: Offshore Mineral Rights, [1967] S.C.R. 762 (Can.).

[30] Oceans Act, §§ 17(1) & 18. The continental margin is defined as the "submerged prolongation of the land mass of Canada consisting of the seabed and subsoil of the shelf, the slope and the rise, but not including the deep ocean floor with its oceanic ridges or its subsoil." *See id*. § 17(1)(a).

[31] Reference re: Ownership of the Bed of the Strait of Georgia and Related Areas, [1984] 1 SCR 388 (Can). The areas under the authority of the provincial government include the Strait of Juan de Fuca, the Strait of Georgia, Johnstone Strait, and Queen Charlotte Strait. *See generally*, Steve Rogers, *Offshore in* SURVEYS, PARCELS AND TENURE ON CANADA LANDS (Brian Ballantyne, ed) (2010), *available at* http://perma.cc/AUX7-5DWR;.

[32] *See generally*, WEST COAST ENVIRONMENTAL LAW, PROVINCIAL JURISDICTION OF BRITISH COLUMBIA OVER COASTAL AND OCEAN MATTERS (2020), https://perma.cc/CD8W-GJKN.

[33] *Id*.

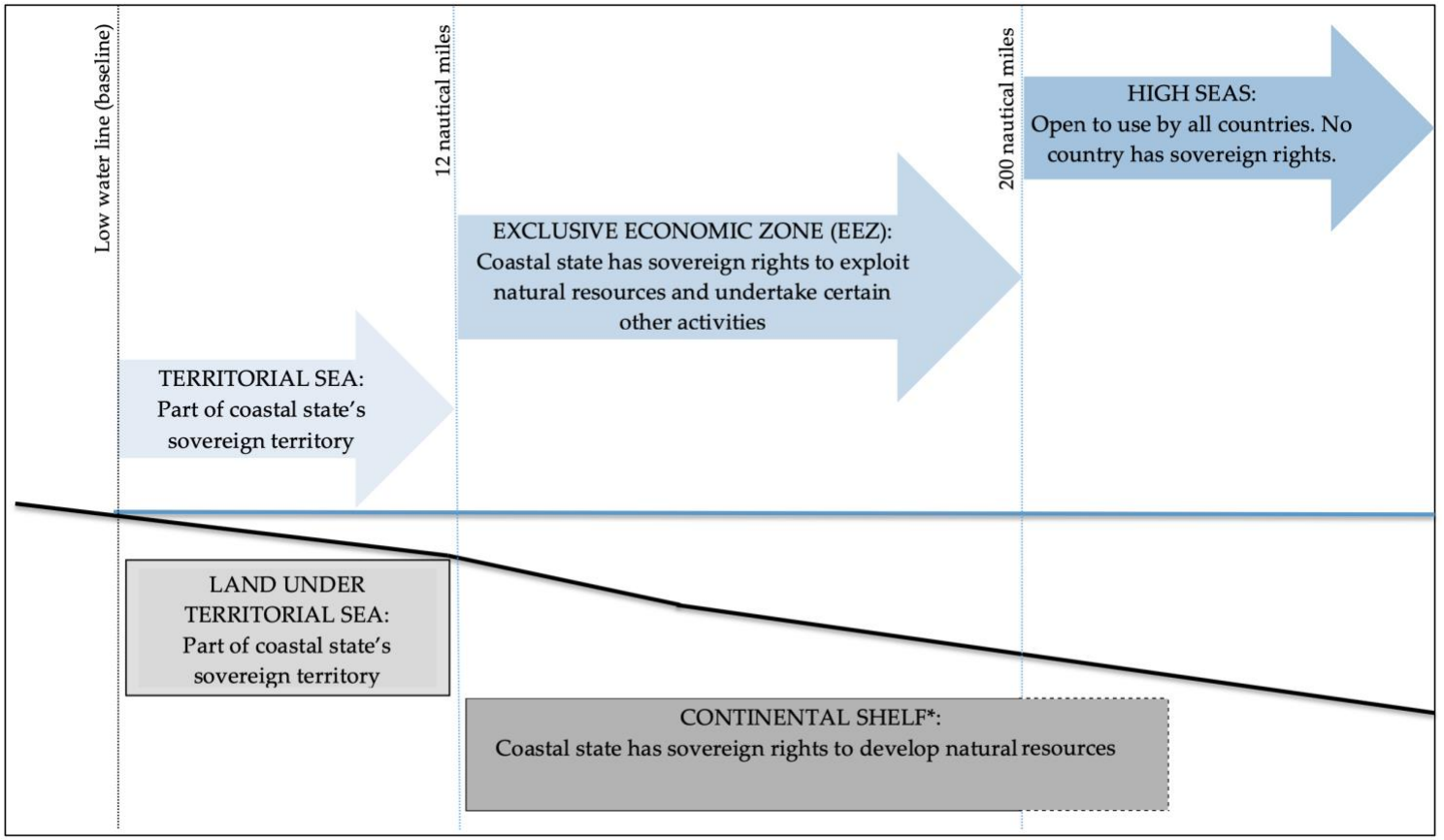

Figure 2: Offshore Zones Identified in UNCLOS[34]

* The continental shelf typically extends 200 nautical miles from shore, but may extend beyond this point in some circumstances.

[34] Romany M. Webb & Michael B. Gerrard, *Overcoming Impediments to Offshore CO2 Storage: Legal Issues in the United States and Canada*, 49 ENVTL. L. REP. 10634, 10637 (2019).

4. USE OF THE SEABED UNDERLYING CANADIAN FEDERAL WATERS

Each component of the Solid Carbon project will require use of the seabed underlying Canadian federal waters. The wind turbines and platform housing the DAC facility will be anchored or otherwise attached to the seabed and the carbon dioxide pipeline buried therein. The pipeline will carry carbon dioxide to the injection site, where a well will be drilled into the seabed and the carbon dioxide injected. To make use of the seabed in these ways, the project developer will require a license or other authorization from the federal government, which controls offshore land underlying federal waters.

The Canadian Oceans Act declares that "the seabed and subsoil below . . . the territorial sea of Canada are vested in her Majesty in right of Canada."[35] Canada also has exclusive "rights over the continental shelf," which comprises the seabed and subsoil extending beyond the territorial sea to the outer edge of the EEZ, and further in some circumstances.[36] As such, in order to make use of the seabed underlying the territorial sea and/or EEZ, third parties must acquire an interest therein from the federal government. There is significant uncertainty as to whether and when interests can be granted for offshore renewable energy development and carbon capture and storage.

No federal statutes expressly provide for the grant of interests in the seabed for activities related to offshore renewable energy development or carbon capture and storage. In a 2020 discussion paper on offshore renewable energy development, NRCan suggested that interests authorizing use of the seabed underlying the territorial sea could be issued under the Federal Real Property and Federal Immovables Act ("FRPFIA"), but that is open to debate.[37]

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[35] Oceans Act, § 8(1).

[36] *Id*. § 18. The continental shelf of Canada extends to the furthest of 200 nautical miles from the baseline or the outer edge of the continental margin, defined as "the submerged prolongation of the land mass of Canada consisting of the seabed and subsoil of the shift, slope and the rise." *See id.* § 17(1).

[37] NATURAL RESOURCE CANADA, DISCUSSION PAPER: CANADA'S APPROACH TO OFFSHORE RENEWABLE ENERGY REGULATIONS 3 (2020), https://perma.cc/H6C5-HY45.

The FRPFIA provides for the issuance of leases and licenses authorizing the use of "federal real property."[38] For the purposes of the FRPFIA, "federal real property" is defined as "real property belonging to Her Majesty," and "real property" is further defined as "land in any province other than Quebec, and land outside Canada."[39] There is some uncertainty as to whether the seabed underlying the territorial sea falls within the FRPFIA definition of "real property" because, while it does not form part of any province, it is arguably still within Canada. In this regard, the Canadian Oceans Act declares that the "territorial sea . . . form[s] part of Canada," but does not say anything about the underlying seabed.[40]

Irrespective of the above, the FRPFIA does not authorize the issuance of leases or licenses with respect to the seabed beyond the territorial sea (i.e., the continental shelf), which is where development related to the Solid Carbon project is most likely to occur. The Canadian Petroleum Resources Act authorizes the Minister of Natural Resources to grant interests in the continental shelf to third parties.[41] Notably, however, those interests only permit the development of oil and gas resources in the shelf and do not deal with its use for other purposes.[42] No other statutes expressly authorize the Minister to grant interests in the continental shelf for activities unrelated to oil and gas development. New legislation may, therefore, need to be enacted to enable use of the continental shelf for offshore renewable energy development and carbon capture and storage.

[38] Federal Real Property and Federal Immovables Act, S.C. 1991, c. 50, §§ 5 & 6.

[39] *Id*. § 2.

[40] Canadian Oceans Act, § 7.

[41] Canadian Petroleum Resources Act, R.S.C. 1995, c.36 (2nd Supp.), §13(1).

[42] *Id*. § 2 (defining "interest" to mean an "exploration license, production license, or significant discovery license" and former versions of those instruments). *See also id*. §§ 22, 29, & 37 (specifying the risks conferred by each type of license). An initial review by NRCan staff found that interests issued under the Canadian Petroleum Resources Act do not permit use of the sea-seabed for carbon storage. NRCan has not, however, taken an official position on this issue. *See generally*, Webb & Gerrard, *supra* note 34, at 10646 (reporting Natural Resources Canada's view as expressed by staff in personal communications with the authors).

5. ADDITIONAL APPROVALS REQUIRED FOR THE SOLID CARBON PROJECT

In addition to rights to use the federal seabed, various other federal permits will be required for the Solid Carbon project. Each component of the project will be subject to different, and sometimes overlapping, permitting requirements.

5.1 Offshore Renewable Energy Development

For the purposes of this analysis, we assume that offshore wind turbines will be used to power the Solid Carbon system. Initial work by the Solid Carbon engineering team indicates that up to 100 turbines, spread across up to eighty-six square miles (223 square kilometers), may be required.[43] While the exact location remains uncertain, the turbines would likely be situated in shallow water relatively close to shore, on the order of twelve to sixty-two miles (twenty to 100 kilometers) from the coast. Each turbine would be mounted on a floating structure anchored to the seabed and linked to the rest of the array and the DAC facility via dynamic (i.e., moving) cables in the water.

As discussed in Part 3 above, a license or other interest will be required to use the seabed to anchor the wind turbines. Additional approvals will also be required from CER and, in some cases, Transport Canada.

(A) Approval by CER

CER was designated as the lead safety regulator for offshore wind and other renewable energy projects in June 2019. At that time, CER's authorizing statute—the Canadian Energy Regulator Act ("CERA")—was revised and expanded to include a new Part 5, dealing with offshore renewable energy projects.[44] Under Part 5 of the CERA, CER approval is required to perform "any work or activity that is related to an offshore renewable energy project" in Canada's territorial sea

[43] This is estimated to be the maximum number of turbines that would be required to power a DAC facility capable of capturing 0.6 million tons of carbon dioxide annually. The estimate is based on the use of turbines with a rated capacity of ten megawatts. A smaller number of turbines would be required if the capacity factor were higher.

[44] The CERA replaced the former National Energy Board Act. That Act did not include any provisions dealing with offshore renewable energy projects.

or EEZ.[45] The term "renewable energy project" is defined broadly to include any project involving the "exploitation of a renewable resource to produce energy."[46] While the CERA does not specify what constitutes a "renewable resource," that term is typically understood to mean an energy resource that is naturally replenishing, such as wind.[47] The CERA does not establish any size thresholds for offshore renewable energy projects. The wind turbines constructed for the Solid Carbon project would, therefore, be covered by the CERA regardless of their number or the amount of energy they produce.

No offshore renewable energy projects had been approved by CER at the time of writing. Before approval can occur, regulations dealing with project safety and environmental protection must be adopted under the CERA.[48] At the time of writing, regulations were being developed by NRCan, and expected to be completed by 2023.[49] At or around that time, CER is also expected to issue guidelines detailing the process and requirements for applying for approval of renewable energy projects, and how it will deal with applications.[50] Some guidance on these issues is, however, already provided in the CERA. The CERA outlines a two-track review process for offshore renewable energy projects—one for projects that require an impact assessment[51] and a second for projects that do not.[52]

[45] Canadian Energy Regulator Act, S.C. 2019, c. 28, § 297(a). *See also, id*. § 2 (defining "offshore renewable energy project").

[46] *Id*. § 2.

[47] *See generally*, U.S. Energy Information Administration, *What is Renewable Energy?*, RENEWABLE ENERGY EXPLAINED, https://www.eia.gov/energyexplained/renewable-sources/ (last updated June 22, 2020).

[48] Interview with Suchaet Bhardwaj, Technical Specialist, Regulatory Development, Canadian Energy Regulator (Nov. 3, 2020).

[49] Natural Resources Canada, *supra* note 37, at 14.

[50] Interview with Suchaet Bhardwaj, Technical Specialist, Regulatory Development, Canadian Energy Regulator (Nov. 3, 2020).

[51] Canadian Energy Regulator Act, § 299.

[52] *Id*. § 298.

With respect to track one, the rules governing impact assessments are set out in the Impact Assessment Act.[53] Regulations issued under the Impact Assessment Act list several categories of "designated projects," which have been found to have significant potential for adverse effects, and thus may require an impact assessment.[54] The list includes projects involving "[t]he construction, operation, decommissioning and abandonment in an offshore area . . . of a new wind power generating facility that has ten or more wind turbines."[55] Before any such project can be approved by CER, it must be referred to the Impact Assessment Agency, which must determine whether an impact assessment is required based on the potential for the project to adversely affect the environment and/or the rights of Indigenous peoples.[56] Where required, project assessments will be conducted by an ad hoc review panel,[57] comprised of at least three members appointed by the Impact

[53] Enacted in June 2019, the Impact Assessment Act replaced the former Canadian Environmental Assessment Act, and established a new framework for review of major projects. The Impact Assessment Act requires certain projects to undergo "impact assessments" which are similar to the "environmental assessments" previously conducted under the Environmental Assessment Act. For a discussion of key differences between the two statutes, *see* IMPACT ASSESSMENT AGENCY, IMPACT ASSESSMENT ACT AND CEAA 2012 COMPARISON (2019), https://perma.cc/52RP-7ULR.

[54] Physical Activities Regulations, SOR/2019-285. It should be noted that, even if a project falls within one of the designated categories, an impact assessment may not be needed. The need for an impact assessment is determined on a project-by-project basis by the Impact Assessment Agency. *See* Impact Assessment Act, § 16.

[55] Physical Activities Regulations, Schedule, § 44. *See also id.* § 1(1) (defining "offshore area" to include Canada's territorial sea, as well as its continental shelf and the superjacent waters). As noted above, any wind energy facility constructed in connection with the Solid Carbon project would be located in the territorial sea or continental shelf, and thus be a "designated project" under the Impact Assessment Act if it comprised ten or more wind turbines, regardless of their size, mounting, or other characteristics.

[56] Impact Assessment Act, § 16. Prior to reaching a decision, the Impact Assessment Agency consults with the project developer, CER, other federal and provincial government agencies, Indigenous communities, and the public. *See generally*, Impact Assessment Agency of Canada, *Phase 1: Planning*, IMPACT ASSESSMENT PROCESS OVERVIEW, https://perma.cc/6GU2-MX72 (last updated Nov. 8, 2019).

[57] Canadian Energy Regulator Act, § 43(b) (providing that the Minister of Environment and Climate Change must refer the impact assessment of a designated project to a review panel if the project involves activities regulated under the CER Act).

Assessment Agency.[58] The review panel must consult with the project developer, CER and other government agencies, Indigenous communities, and the public and then develop an impact assessment report.[59] The impact assessment report must include a description of the project, its likely environmental and other effects, measures to mitigate any adverse effects, and alternatives to the project and their effect.[60] Based on the impact assessment report, the Governor-in-Council must decide whether the project's adverse effects are "in the public interest," taking into account:

- the significance of the project's adverse effects;
- any effects of the project on Indigenous peoples;
- the implementation of measures to mitigate any adverse effects of the project;
- the extent to which the project contributes to sustainability; and
- the extent to which the project hinders or contributes to the government's ability to "meet its environmental obligations and its commitments in respect of climate change."[61]

The Governor-in-Council's decision is binding on CER in the sense that it can only authorize a project that has undergone an impact assessment if the project's adverse effects are found to be in the public interest.[62] CER must base its authorization decision solely on the impact assessment report[63] and, where it authorizes a project, must require the developer to comply with any conditions it or the Minister of Environment considers appropriate based the report's findings.[64]

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[58] *Id*. § 47(1) (providing that the review panel for projects involving activities regulated under the CER Act must consist of a chairperson and at least two other members appointed by the Impact Assessment Agency). *See also id*. § 47(2)-(3) (outlining the requirements for appointment to a review panel).

[59] *See generally*, Impact Assessment Agency of Canada, *Phase 3: Impact Assessment*, IMPACT ASSESSMENT PROCESS OVERVIEW, https://perma.cc/JVX2-5BBH (last updated Nov. 21, 2019).

[60] Impact Assessment Act, § 22.

[61] *Id*. § 63. *See also id*. §§ 60-62 (providing that public interest determinations must ordinarily be made by the Minister of Environment, but requiring the Minister to refer the determination to the Governor in Council where the impact assessment for the project in question was conducted by a review panel).

[62] *Id*. § 8(b).

[63] Canadian Energy Regulator Act, § 299(b).

[64] Impact Assessment Act, § 64; Canadian Energy Regulator Act, § 298(9).

With respect to track two, offshore wind and other renewable energy projects that do not require an impact assessment (e.g., because they involve the construction of less than ten turbines) are reviewed solely by CER. In determining whether to authorize such a project, CER must consider all relevant factors, including:

- the project's environmental, health, social, and economic effects;
- the interests and concerns of Indigenous peoples and any effects of the project on their Constitutionally-recognized rights;
- the safety and security of persons and the protection of property and the environment; and
- the extent to which the project hinders or contributes to the government's ability to "meet its environmental obligations and its commitments in respect of climate change."[65]

Authorized projects are, again, subject to conditions imposed by CER.[66]

(B) Approval by Transport Canada

In addition to authorization from CER, certain offshore wind projects also require approval from Transport Canada under the Canadian Navigable Waters Act ("CNWA"). The CNWA regulates the construction or placement of "works in, on, over, under, through, or across any navigable water."[67] For the purposes of the CNWA, a "work" includes any temporary or permanent "structure, device, or other thing . . . that is made by humans," such as a wind turbine.[68] Areas of the Pacific Ocean lying beyond provincial jurisdiction and extending twelve nautical miles from shore are considered "navigable waters" under the CNWA.[69] The CNWA will, therefore, apply to the wind energy component of the Solid Carbon project if the turbines are located within Canada's territorial sea.

Under the CNWA, a person wishing to construct a work in navigable waters must generally obtain approval from Transport Canada if the work or its construction "may interfere with

[65] Canadian Energy Regulator Act, § 298(3).

[66] *Id*. § 298(9).

[67] Canadian Navigable Waters Act, § 3.

[68] *Id*. § 2.

[69] *Id*. § 2 & Schedule.

navigation."[70] Transport Canada takes the view that any structure placed in the water "may interfere with navigation" and thus requires approval under the CNWA.[71]

Applications for approval of any work in navigable waters must be filed with Transport Canada. On filing, the applicant must publish a notice, inviting interested persons to provide written comments on his/her/its application to Transport Canada.[72] After considering any comments received, Transport Canada must determine whether approval of the work is appropriate in the circumstances, taking into account:

- the characteristics of the navigable water in which the work will be constructed;
- the current or anticipated nature, extent, and safety of navigation in the navigable water;
- the impact of the work, both in isolation and in combination with other works, on navigation; and
- the applicant's record of compliance under the CNWA (if any).[73]

Approvals are subject to any terms and conditions imposed by Transport Canada. Approvals for offshore structures are typically conditioned on the installation of lights and/or warning devices to alert vessels to the presence of the structure.[74]

5.2 Offshore DAC

The Solid Carbon system will remove carbon dioxide from the ambient air using a DAC facility situated offshore on a floating platform that is anchored to the seabed. As discussed in Part 2 above, in order to anchor to the seabed, the project developer must obtain a license or similar

[70] Canadian Navigable Waters Act, §§ 4.1 & 10. Approval is not required for "minor works" that have been designated by the Minister of Transport as likely to only "slightly interfere with navigation." *See id*. §§ 2 & 28(2)(a). The Minister has not designated wind turbines as "minor works."

[71] Interview with Ryan Greville, Manager, Navigation Protection Program, Transport Canada (Nov. 13, 2020).

[72] Canadian Navigable Waters Act, § 7(3)-(4).

[73] *Id*. § 7(6)-(7).

[74] Interview with Ryan Greville, Manager, Navigation Protection Program, Transport Canada (Nov. 13, 2020).

interest from the federal government.[75] Additional federal permits or other approvals may also be required in some cases. Most notably, if the platform is located within Canada's territorial sea, it will require approval from Transport Canada under the CNWA.[76] Transport Canada takes the view that offshore platforms, like offshore wind turbines, "may interfere with navigation" and are thus subject to the CNWA.[77] The process and requirements for approval of offshore platforms under the CNWA are the same as those for offshore wind turbines.[78]

5.3 Offshore Carbon Dioxide Transport

Carbon dioxide captured at the DAC facility will likely be transported to the injection site via pipeline. A license or other authorization from the federal government will, again, be required to bury a pipeline in the seabed.[79] A permit authorizing pipeline construction and operation will also be required under the CERA.

Part 3 of the CERA regulates the construction, operation, and abandonment of "pipelines," with that term defined broadly to include any line "that connects at least two provinces or extends beyond the limit of a province . . . and that is used or is to be used for the transmission of oil, gas, or any other commodity."[80] The CER has previously determined that offshore pipelines underlying Canadian federal waters "extend beyond the limits of a province" and are thus subject to the CERA if used to transport oil, gas, or another commodity.[81] The term "commodity" is not defined in the CERA, but has been held to include carbon dioxide.[82]

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[75] *See supra* Part 2.

[76] Canadian Navigable Waters Act, §§ 4 & 5.

[77] Interview with Ryan Greville, Manager, Navigation Protection Program, Transport Canada (Nov. 13, 2020).

[78] *See supra* Part 3.1.

[79] *See supra* Part 2.

[80] Canadian Energy Regulator Act, § 2.

[81] National Energy Board, Reasons for Decision: Sable Offshore Energy Project and Maritime & Northeast Pipeline Project, Decision No. GH-6-96 (Dec. 1997), https://perma.cc/C4YY-9WGN.

[82] National Energy Board, Reasons for Decision: Souris Valley Pipeline Limited, Decision No. MH-1-98 (Oct. 1998), https://perma.cc/5DLF-T3SB.

Under the CERA, with some limited exceptions, only companies incorporated under the Canadian Business Corporations Act or an equivalent provincial statute can construct and operate pipelines.[83] Each pipeline must be certified by CER.[84] On receiving an application for pipeline certification, CER typically invites comments from the public.[85] After considering any comments received and the information provided by the applicant, CER prepares a report, setting out its recommendation as to whether a certificate should be granted and, if so, any conditions it considers in the public interest or otherwise necessary to attach to the certificate.[86] CER must base its recommendation on the economic, technical, and financial feasibility of the pipeline and its environmental and socio-economic impacts. Specifically, CER must consider:

- the environmental, health, social, and economic effects of the pipeline;
- the safety and security of persons and the protection of property and the environment;
- the interests and concerns of Indigenous peoples and any effects of the project on their Constitutionally-recognized rights;
- the availability of oil, gas, or another commodity to the pipeline;
- the economic feasibility of the pipeline and the existence of actual or potential markets for its services;
- the financial resources, responsibility and structure of the applicant and the methods for financing the pipeline,

[83] Canadian Energy Regulator Act, § 179(1) (declaring that a "person, other than a company, must not construct, operate or abandon a pipeline"). *See also id*. § 2 (defining "company"). There is an exception for persons specifically authorized to construct or operate pipelines in an Act of Parliament or letters patent issued under the Canada Corporations Act. *See id*. § 2.

[84] *Id*. §§ 180 (declaring that a company can only operate a pipeline if "a certificate is in force with respect to that pipeline"), 198 (declaring that "a company must not begin the construction of a . . . pipeline unless (a) the Commission has issued a certificate in respect of the pipeline" and certain other requirements are met), and 218 (prohibiting the construction and operation of "a pipeline that passes in, on, over, under, through or across a navigable water unless a certificate has been issued").

[85] *Id*. § 183(3). For a discussion of CER's review process, *see generally*, CER, *Regulation of Pipelines and Power Lines*, OUR RESPONSIBILITIES, https://perma.cc/P59F-DJYA (last updated Nov. 5, 2020).

[86] Canadian Energy Regulator Act, § 183(1).

- the extent to which the effects of the pipeline hinder or contribute to the government's ability to "meet its environmental obligations and its commitments in respect of climate change;" and
- any public interest that may be affected by certification or refusal to certify the pipeline.[87]

CER's report must be made publicly available and submitted to the Minister of Natural Resources.[88] Based on the report, the Governor in Council must direct CER to either certify the pipeline or dismiss the certification application, and CER must comply with that direction.[89]

It should be noted that impact assessments are generally not required for carbon dioxide pipelines. Under the Impact Assessment Act, impact assessments are only required for so-called "designated projects," which are listed in regulations issued under the Act or specified by the Minister of Environment and Climate Change.[90] At the time of writing, the regulations listed three categories of designated pipeline projects, namely:

1. "offshore oil and gas pipelines";
2. onshore pipelines requiring "a total of 75 km or more of new right of way"; and
3. on- or offshore pipelines located "in a national marine conservation area" that "carry[]a substance other than water."[91]

Any carbon dioxide pipeline developed for the Solid Carbon project would not fall within categories (1) or (2) above.[92] With respect to category (3), we note that a national marine conservation area (known as "Gwaii Haanas") has been established around the southern tip of Haida Gwaii, as shown

[87] *Id*. § 183(2).

[88] *Id*. § 183(1).

[89] The Governor-in-Council can only direct CER to certify a pipeline if recommended in the CER report. *Id*. § 186.

[90] Impact Assessment Act, § 8.

[91] Physical Activities Regulations, § 2(1) & Schedule, §§ 4, 40, & 41.

[92] We understand that carbon dioxide would likely be transported from the DAC facility to the injection site in liquid form. We note, however, that the carbon dioxide could be transported as gas. Nevertheless, even if that occurred, the pipeline used to carry the carbon dioxide is unlikely to be considered a "gas pipeline" within category (1) in the regulations. CER has consistently interpreted the term "gas pipeline" to mean a pipeline used to carry natural gas and has viewed carbon dioxide as a "commodity" other than "gas." *See generally*, National Energy Board, *supra* note 81; National Energy Board, *supra* note 82.

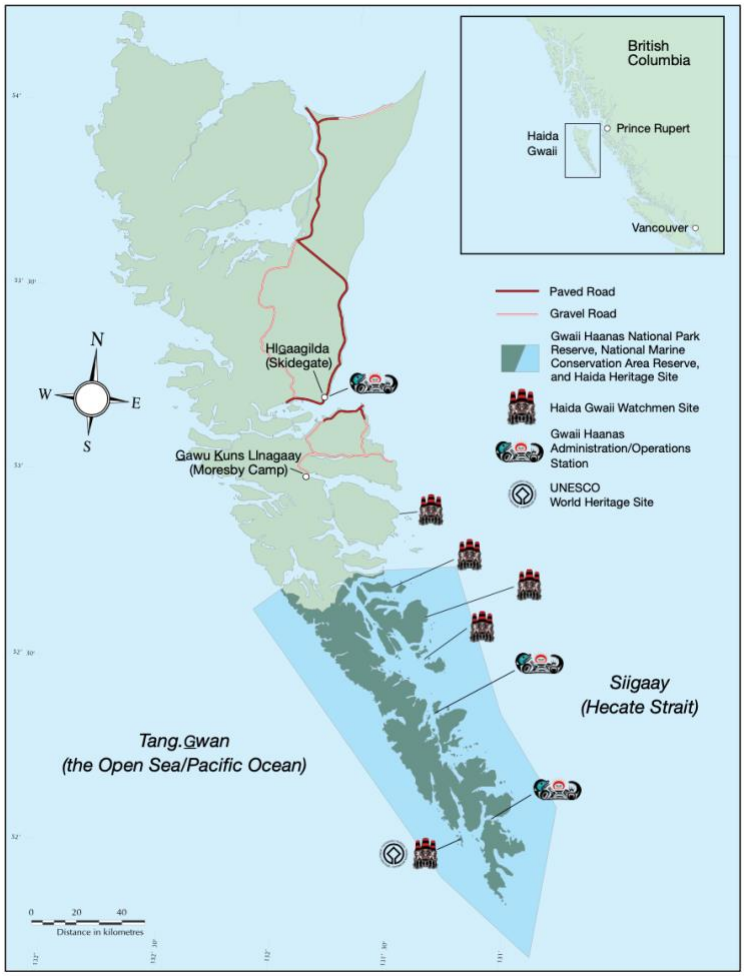

Figure 3: Gwaii Haanas National Marine Conservation Area[93]

in Figure 2 below.[94] We assume that any pipeline developed for the Solid Carbon project would not be located within the national marine conservation area since that area is situated to the east of the anticipated site for the wind energy and DAC facilities. However, even if the pipeline were located outside the area, it could be designated by the Minister of Environment and Climate Change.[95] If designated, the pipeline would be referred to the Impact Assessment Agency, which would

[93] COUNCIL OF THE HAIDA NATION AND PARKS CANADA, GWAII HAANAS MANAGEMENT PLAN 4 (2018), https://perma.cc/S4SP-QU48.

[94] *See generally*, Parks Canada, *Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site*, NATIONAL PARKS, (last updated Mar. 4, 2019).

[95] Impact Assessment Act, § 9.

determine whether an impact assessment is required based on the potential for the project to adversely affect the environment and/or the rights of indigenous peoples.[96]

5.4 Offshore Carbon Dioxide Storage

The Solid Carbon project is proposing to inject all of the carbon dioxide captured by the DAC facility into sub-seabed rock formations in the Cascadia basin. Located approximately 100 miles (160 kilometers) from shore, the Cascadia basin straddles areas under Canadian and U.S. jurisdiction. For the purposes of this analysis, we assume that any injection of carbon dioxide would occur in the Canadian portion of the basin, and that there is no possibility of subsurface migration of the carbon dioxide into areas under the jurisdiction of the U.S.[97]

As discussed in Part 2 above, in order to store carbon dioxide in the sub-seabed, the project developer must obtain a license or similar authorization from the federal government. The developer must also obtain a permit from the Minister of Environment and Climate Change under the Canadian Environmental Protection Act ("CEPA").[98]

Division 3 of Part 7 of the CEPA regulates the "disposal" of materials at sea.[99] The term "disposal" is defined broadly to include, among other things, "the storage on the seabed, in the subsoil of the seabed or on the ice in any area of the sea of a substance that comes from a ship, an aircraft, a platform or another structure."[100] This definition would encompass the injection of carbon dioxide into sub-seabed geologic formations (i.e., effectively the "subsoil of the seabed") where the carbon dioxide "comes from a . . . structure." There is some uncertainty as to what constitutes a structure for the purposes of the definition. In interpreting other provisions of the CEPA, ECCC has

[96] *Id*. § 16. Prior to reaching a decision, the Impact Assessment Agency consults with the project developer, CER, other federal and provincial agencies, Indigenous communities, and the public. *See generally*, Impact Assessment Agency of Canada, *Phase 1: Planning*, IMPACT ASSESSMENT PROCESS OVERVIEW, https://perma.cc/6GU2-MX72 (last updated Nov. 8, 2019).

[97] We understand that, while there may be some subsurface migration of the carbon dioxide after injection, it would likely flow north of the injection site and thus away from U.S. territory.

[98] Canadian Environmental Protection Act, S.C. 1999, c.33, Pt. 7, Div. 3.

[99] *Id*. § 122.1.

[100] *Id*. § 122(1).

concluded that the term "structure" excludes pipelines.[101] If that is the case, offshore carbon dioxide storage would not be regulated as a form of "disposal" under the CEPA if a pipeline system were used to transport the carbon dioxide from shore and deposit it into the sub-seabed, without the use of any ship, platform, or similar facility.[102] For the purposes of this analysis, we assume that would not occur in the Solid Carbon project. As currently designed, the project would capture carbon dioxide on an offshore platform and inject it into the sub-seabed from that or another platform, or a ship. The injection will, therefore, be regulated as a form of disposal under the CEPA.

Under the CEPA, a substance can only be disposed of in Canada's territorial sea or EEZ if "the substance is waste or other matter" of a type listed in Schedule 5 of the Act, and the "disposal is done in accordance with a Canadian permit" issued by the Minister of Environment and Climate Change.[103] Permits can only be issued for the disposal of waste or other matter listed in Schedule 5.[104] At the time of writing, Schedule 5 of the CEPA did *not* list carbon dioxide, meaning that the Minister could *not* permit the offshore disposal of carbon dioxide.[105]

ECCC has previously recommended that CEPA "be amended to expressly authorize the Minister of [Environment and Climate Change] to issue permits for the storage of [carbon dioxide] in sub-seabed geologic formations."[106] A bill to implement the necessary amendments is expected to be introduced into Parliament in 2021.[107] If the legislation is passed, ECCC will then develop

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[101] *See generally*, Webb & Gerrard, *supra* note 42, at 10644 (reporting ECCC's interpretation as expressed by staff in personal communications with the authors).

[102] *Id*.

[103] Canadian Environmental Protection Act, § 125(1). *See also id*. §§ 122(1) (defining "waste or other matter") & 122(2) (defining "sea").

[104] Id. § 127.

[105] *Id*. Schedule 5. *See also* Webb & Gerrard, supra note 101, at 10645 (explaining why the list in Schedule 5 of the CEPA excludes carbon dioxide).

[106] ECCC, CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999: ISSUES AND POSSIBLE APPROACHES 22 (2016), http://perma.cc/E4CN-5VEP.

[107] Email from David Taillefer, Head, Antarctic and Marine Project Development, Environmental Protection Branch, ECCC (Oct. 1, 2020, 14:51 EST) (on file with authors).

guidelines outlining the process and requirements for applying for a permit to store carbon dioxide in the sub-seabed, and how it will deal with such applications.[108]

It should be noted that, even if the CEPA is amended to allow sub-seabed carbon storage, projects in the Cascadia basin could face other restrictions. Parts of the basin and surrounding areas, shown in Figure 3 below, have been proposed for designation as a "marine protected area" under the Canadian Oceans Act. Section 35 of the Canadian Oceans Act authorizes the Governor-in-

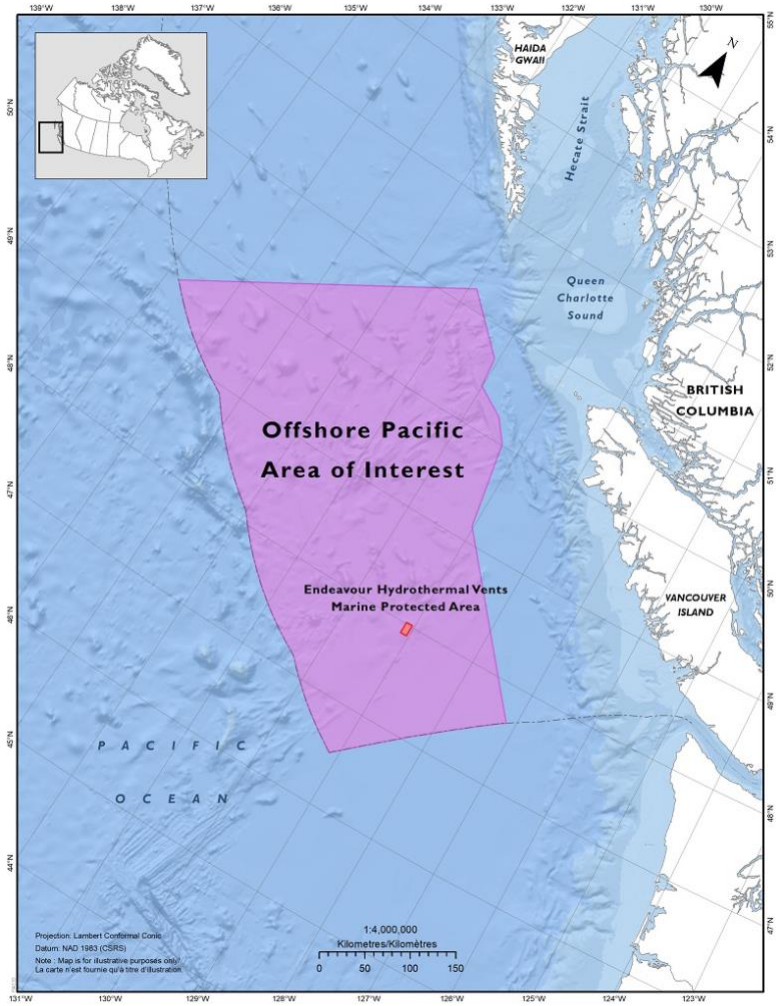

Figure 4: Proposed Marine Protected Area off the West Coast of British Columbia[109]

[108] Interview with David Taillefer, Head, Antarctic and Marine Project Development, Environmental Protection Branch, ECCC, in N.Y., N.Y. (Apr. 20, 2018).

[109] Fisheries and Oceans Canada, Offshore Pacific Area of Interest (AOI), Marine Protected Areas, https://perma.cc/BQS3-GCWA (last updated March 5, 2020).

Council, on the recommendation of the Ministry of Fisheries and Oceans, to designate offshore areas requiring special protection due to their ecological or biological significance.[110] Once an area is designated, regulations may be adopted prohibiting or restricting activities therein.[111] Regulations applying to other designated areas have, for example, included a general prohibition on activities that disturb living marine organisms and their habitats.[112] Sub-seabed carbon dioxide storage necessarily requires drilling and injecting materials into the seabed, which could disturb marine organism and/or their habitats, and thus violate the prohibition.

6. CONCLUSION

Offshore carbon capture and storage could play an important role in mitigating climate change by avoiding further increases in, or reducing, the atmospheric carbon dioxide load. Using DAC facilities mounted on offshore platforms and powered by offshore wind turbines, carbon dioxide could be removed from the atmosphere and permanently stored in sub-seabed rock formations. The Solid Carbon project is exploring the possibility of capturing and storing carbon dioxide in the Canadian territorial sea or EEZ off the west coast of British Columbia. That area is the site of the Cascadia Basin, a sub-seabed geologic formation comprised of basalt, a type of rock that reacts with carbon dioxide to form carbonate minerals, effectively converting it into an immovable solid. As such, the Cascadia Basin is thought to be a promising site for carbon dioxide storage, where there is low risk of leakage.

The legal framework for capturing and storing carbon dioxide in Canadian waters is highly complex. As discussed in this paper, Canada does not have a single, comprehensive legal framework specific to offshore carbon capture and storage. However, there are multiple Canadian laws that could apply to different components of an offshore carbon capture and storage project, depending

[110] Oceans Act, § 35(3)(a). *See also id*. § 35(1) (listing the grounds on which an area may be designated).

[111] *Id*. § 35(3)(b).

[112] *See e.g.*, Anguniaqvia niqiqyuam Marine Protected Area Regulations, SOR/2016-280, § 3 (prohibiting, in the marine protected area, "any activity that disturbs, damages, destroys or removes from the Marine Protected Areas any living marine organism or any part of its habitat or is likely to do so").

on exactly where and how it is carried out. For example, several laws require permits or other approvals to be obtained prior to the installation of offshore wind turbines, platforms, and pipelines, and the drilling of wells. Moreover, use of the seabed for those activities would require a license from the federal government, which controls the submerged land underlying Canadian waters. There is considerable uncertainty as to whether the federal government is authorized, under existing law, to grant licenses for use of the seabed for offshore carbon capture and storage. New legislation may need to be enacted to facilitate licensing. The various government agencies responsible for issuing licenses, permits, and other approvals required for offshore carbon capture and storage will also likely need to develop new regulations and guidance documents. Where possible, project developers should participate in relevant regulatory proceedings and agency consultations, and advocate for a regulatory framework that facilitates offshore carbon capture and storage.

APPENDIX: APPROVALS REQUIRED FOR SOLID CARBON PROJECT

Table 2: Approvals Required by Project Component and Location

Location	Project Component			
	Wind Energy Facility	**DAC Facility**	**Carbon Dioxide Pipeline**	**Carbon Dioxide Injection Operation**
Territorial Sea	Seabed license CERA approval CNWA permit	Seabed license CNWA permit	Seabed license CERA certification	N/A
EEZ / Continental Shelf	Seabed license CERA approval	Seabed license		Seabed license CEPA Permit

Table 3: Government Agencies Required to Approve Project Components

Government Agency	Action Required	Notes
CER	Approve wind energy project Certify carbon dioxide pipeline	CER is authorized to approve wind energy projects and certify carbon dioxide pipelines under the CERA. However, before any wind energy project can be approved under the CERA, regulations dealing project safety and environmental protection must be adopted. The necessary regulations are expected to be finalized in 2023.
ECCC	Permit sub-seabed carbon dioxide injection	ECCC is authorized to permit the sub-seabed injection of materials under the CEPA. Permits can only be issued for the injection of listed substances. Carbon dioxide is not listed. The CEPA will, therefore, need to be amended before any carbon dioxide injection can be permitted.
NRCan	Issue license for use of the seabed for wind energy facility, DAC facility, carbon dioxide pipeline, and carbon dioxide injection operation	No statute expressly authorizes the grant of seabed licenses for renewable energy projects or carbon capture or storage. NRCan has suggested licenses may be issued with respect to the seabed underlying the territorial sea under the Federal Real Property and Federal Immovables Act ("FRPFIA") but that is uncertain. New legislation may be needed to authorize the grant of licenses.

Government Agency	Action Required	Notes
Transport Canada	Permit wind energy project and offshore platform (if located within the territorial sea)	Transport Canada is authorized to permit offshore structures located in the territorial sea under the CNWA.