Marine Renewable Energy Assets and the Climate Bonds Standard

Background Document to Eligibility Criteria

Marine Technical Working Group
Climate Bonds Initiative

October 2017
(Updated Jul 2020 to incorporate dedicated installation vessels)

Prepared by:
Dr. Christine Negra, Versant Vision LLC

Prepared by: CLARMONDIAL versant vision Sponsored by: The ROCKEFELLER FOUNDATION KR foundation

Table of Contents

I. Introduction 2
Marine systems and climate change 2
Developing eligibility Criteria for bond certification 3

II. Marine renewable energy investments and potential for growth 5
Incentives and state-of-play for marine renewable energy bonds 5
Marine renewable energy investments with beneficial climate impacts 7
Implications for eligibility Criteria for Marine Renewable Energy 7

III. Discussion and establishment of eligibility Criteria 9
1. Specific features of the marine sector 9
2. Potentially eligible Marine assets and activities 10
3. Foundation for disclosure requirements 15
4. Foundation for Marine Renewable Energy mitigation Criteria 16
5. Foundation for Marine adaptation and resilience Criteria 18
6. Alignment with other sectoral Criteria 25

Appendix 1 – Working groups 27

Appendix 2 – Definitions 29

Appendix 3 – Debt capital markets and green investments 30

Appendix 4 – Pathway to certification 33

Appendix 5 – Feedback from public consultation 34

List of tables

Table 1. Examples of recent bonds in the marine renewable energy sector. 6
Table 2. Examples of interventions to mitigate GHG emissions and / or increase climate adaptation capacity and resilience through marine renewable energy. 13
Table 3. Adaptation and resilience checklist. 23
Table 4. Stakeholders with direct interest in green investments span multiple sectors. 31
Table 5. Examples of potential bond types, issuers, and revenue streams of bonds that could be eligible for Climate Bonds Certification 32

I. Introduction

The marine sector plays a critical role in the global carbon cycle, presenting opportunities for greenhouse gas emission reductions and for carbon sinks. In addition, to counteract material impacts of climate change on communities and businesses that rely on marine systems, investments to promote adaptation capacity and resilience will be necessary. Marine ecosystems and the benefits they provide are threatened by changing weather patterns and acidification and temperature changes in ocean water. At the same time, marine systems can contribute to the transition away from fossil fuel when renewable energy systems are safely deployed. Science-based Criteria can enable investors to identify marine bond issuances that have a beneficial climate related impact, encouraging the flow of capital towards responses to climate change such as renewable energy generation.

Marine systems and climate change

Marine resources are central to both local livelihoods and commerce, including energy generation, seafood production, coastal economic activities, shipping, tourism, and mining, representing over USD 4 trillion per year in economic activity.[1,2] The type, location, and intensity of marine resource use is changing and economic damage from mismanagement of these resources has been estimated at over USD 200 billion per year.[3] One of the UN Sustainable Development Goals calls for conservation and sustainable use of the oceans, seas, and marine resources and sets out targets related to pollution, resilience, acidification, sustainable management of fish and other resources, subsidy reform, knowledge development, artisanal fishers, and legal frameworks.[4]

Marine related economic sectors contribute to global greenhouse gas (GHG) emissions, yet are also an important sink for atmospheric carbon. These sectors are also at risk from the impacts of GHG emissions to the atmosphere: climate change poses significant risks to marine ecosystems with high potential to negatively affect productive uses of some marine resources and related socio-economic systems.[5] Major climate change impacts to marine ecosystems include higher air and water temperatures, sea level rise, rainfall and river discharge, changing weather, extreme events, and ocean acidification.[6] These impacts are affecting marine populations and species interactions, triggering alterations in the magnitude, distribution, and timing of species abundance including economically important fisheries,[7] and presenting an array of impacts and risks to coastal infrastructure. One estimate of the cost of avoidable climate change impacts on the world's oceans is USD 322 billion per year by 2050.[8]

Appropriate investment in marine related sectors is essential for promoting climate change mitigation and adaptation and facilitating increased resilience of communities, infrastructure, and ecosystems.[9] These investments are especially important in emerging economies, where marine related sectors are key contributors to economic activity, livelihoods, and nutritional security. Appropriate and responsible

[1] Paul Holthus. "World Ocean Council: Ocean Investment Platform and Sustainable Development Goals (SDGs)." WOC 4th Sustainable Ocean Summit. Rotterdam, The Netherlands, 30 Nov-2 Dec 2016.
[2] WWF estimates annual economic value of coastal / oceanic environments at USD 2.5 trillion, excluding oil, gas, and mining (Hoegh-Guldberg O. et al. 2015. Reviving the Ocean Economy: the Case for Action. Gland, Switzerland: WWF International).
[3] Hudson and Glemarec. 2012. Catalysing Ocean Finance: Transforming Markets to Restore and Protect the Global Ocean. New York, USA: UNDP-GEF.
[4] UN DESA, 2016. https://sustainabledevelopment.un.org/sdg14
[5] Doney et al. 2012. Climate change impacts on marine ecosystems. Annu. Rev. Mar. Sci. 4:11-37.
[6] Over one-quarter of anthropogenic carbon dioxide emissions have partitioned into ocean waters, decreasing aquatic pH levels (via formation of carbonic acid) and negatively affecting shell formation, habitat, and food webs. Sea ice retreat is rapidly changing marine systems in the Arctic.
[7] Doney et al. 2012. Climate change impacts on marine ecosystems. Annu. Rev. Mar. Sci. 4:11-37.
[8] Noone et al. eds. 2012. Valuing the Ocean – Draft Executive Summary. Stockholm Environment Institute.
[9] Climate mitigation activities generally have global beneficial impacts as compared to more localized (direct) benefits of climate adaptation and resilience.

investments in marine related sectors can help emerging countries transition to more sustainable growth pathways including appropriate implementation of marine renewable energy capacity.

Within this broad marine context, this Background Document and associated Climate Bonds Standard Marine Renewable Energy Criteria consider assets and use of proceeds specifically relating to Marine Renewable Energy. This includes offshore or near-shore wind, offshore or near-shore solar, wave power facilities, tidal power facilities, dedicated supporting infrastructure, and other emerging marine renewable energy technologies. Criteria for other elements of the marine economy, most notably Fisheries, Aquaculture, Coastal Infrastructure, and Marine transport, are under development and will follow separately.

Developing eligibility Criteria for bond certification

Objective

To create sector-specific eligibility Criteria for investors, industry, and governments that will catalyze increased investment and drive transparency and better reporting for projects and assets linked to Marine Renewable Energy Certified Climate Bonds.

Marine Technical Working Group

The Climate Bonds Initiative convened a Technical Working Group (TWG) to: (i) define qualifying marine renewable energy related assets and activities for certification under the Climate Bonds Standard, and (ii) specify recommended monitoring and evaluation frameworks and appropriate intersection with other standards and certification schemes where possible.

The work of the Marine TWG was initiated with a marine sector Issues Paper and a TWG survey. These provided the foundation for development of this Background Document, which has been further informed by desktop research, eleven full and subgroup TWG conference calls, and multiple rounds of technical review as well as advice and feedback received through engagement with the Industry Working Group and through a six-week public consultation.

The Marine TWG has explored the issues around developing verifiable, science-based Criteria for certifying bond offerings linked to marine assets and activities.[10] Supported by technical lead specialists, the TWG has undertaken the following tasks:

- Review knowledge emerging from diverse sources regarding 'green' investments to develop a list of potential marine renewable energy sector assets and activities with sufficient foundation for development of eligibility Criteria;
- Discuss credible, existing certification programs, standards, and industry guidance relevant to marine renewable energy assets;
- Characterize available, cost-effective impact measurement techniques for climate mitigation, adaptation, and resilience activities;
- Develop initial versions of marine renewable energy eligibility Criteria for qualifying climate mitigation, adaptation, and resilience investments, excluded activities, and recommended monitoring and evaluation frameworks;
- Develop a succinct industry guidance document;[11]
- Publish eligibility Criteria for public comment, revise, finalize, and seek Climate Bonds Standard Board approval;

[10] Importantly, the Marine Renewable Energy Criteria specify environmental performance, not financial performance.
[11] This is specialized guidance for entities who will be hired by bond issuers to independently verify bond-eligible project categories and planned reporting frameworks. It includes clarifications regarding boundaries or intersections with the Climate Bonds Standard's other sector specific Criteria (e.g. Water and Transport).

- Specify governance arrangements for updating and refining the eligibility Criteria and guidance over time, in response to scientific and regulatory progress.

Marine Industry Working Group

A Marine Renewable Energy Industry Working Group (IWG), which is composed of potential bond issuers, investors, and verifiers, was also convened under the Climate Bonds Initiative Standard and Certification Scheme. The IWG mandate was to evaluate TWG proposals and to provide feedback based on potential demand and industry interest.[12] The IWG's over-arching objectives were to provide feedback on: (i) whether the Criteria are usable by the market, and (ii) if the Criteria ensure a marine renewable energy asset or project is low carbon and climate resilient.

For a list of TWG and IWG members, please refer to Appendix 1.

This document

This Background Document provides context to the work of the Marine Technical Working Group (TWG) under the Climate Bonds Standard and Certification Scheme. It summarises the issues considered by the TWG in developing certification eligibility Criteria.

Accompanying documents

1. Marine Renewable Energy Criteria Document: contains the complete Criteria requirements
2. Marine Renewable Energy Criteria Summary: a 2-page summary of the Marine Renewable Energy Criteria
3. Climate Bonds Standard V2.1: gives the context, purpose and the complete requirements of the Climate Bonds Standard (V2.1 is the most recent update). All certified bonds must comply with the requirements of this document, in addition to the relevant sector-specific Criteria.
4. Climate Bonds Standard & Certification Scheme Brochure: summarises the purpose, context and requirements of the Climate Bonds Standard & Certification Scheme

[12] The mandates of the technical and industry working groups are specified under the Climate Bonds Standard Program governance structure. https://www.climatebonds.net/standards/about/governance2

II. Marine renewable energy investments and potential for growth

Capital markets have an important role to play in mobilizing equity and debt funding for green growth investments. They can enable the public to support renewable energy financing, both directly through listed vehicles as well as through institutional investors such as pension funds. Historically, 'green' and 'sustainability' interest has primarily been directed at equities, however the debt capital markets are rapidly expanding their role in the transition to a low carbon and climate resilient economy. (See Appendix 2 for further discussion.)

The Climate Bonds Initiative is focused on shifting the largest capital market of all: the USD 100 trillion bond market.[13] The strategy is to develop a large and liquid green bond market that will help drive down the cost of capital for climate related projects in developed and emerging markets. This involves improving aggregation mechanisms for fragmented sectors, supporting governments seeking to tap the debt capital markets, and determining threshold performance levels that specify when investments are sufficiently climate-compatible to merit the label of a climate bond.

Development of eligibility Criteria under the Climate Bonds Standard is intended to broaden knowledge and capacity among potential bond issuers and promote major growth of an investment-grade climate bond portfolio. By providing a clear definition of eligible activities, the Criteria provide assurance about the climate benefits of certified bonds and help investors to find 'low-carbon' and 'climate-smart' investment opportunities. Climate Bond Certification Criteria provide science-based guidance to both reduce greenhouse gas emissions as well as increase the adaptive capacity and resilience of marine systems that underpin investments.[14]

Incentives and state-of-play for marine renewable energy bonds

Increasing awareness among governments, companies, and financial institutions has spurred interest in green labelled bonds and other investment vehicles as a mechanism to reduce risk and increase sustainability. Investor interest in marine renewable energy is likely to rise given increasing recognition of the growing demand for non-fossil fuel energy.

Green bonds represent a viable financing strategy for marine renewable energy projects (i.e. installation, operation, maintenance, decommissioning). Given the pre-commercial stage of many marine renewable energy technologies, most examples of debt finance in this sector to date are in offshore wind. Appeal to bond investors will hinge on increased technological and financial scale, predictable operational costs, performance warranties from technology providers, secure electricity markets (e.g. purchase power agreement), and overall higher levels of experience.[15]

[13] Moody's has forecast that the green bond market will grow to USD 70 billion in 2016. http://www.reuters.com/article/climatechange-greenbonds-moodys-idUSL5N17O5MY Standard & Poor estimates corporate green bond issuances adding up to as much as USD 28 billion this year.
[14] Definitional work recognizes the diversity of countries, issuers, and verifiers as well as the potential for secondary uses of the sectoral Criteria by other entities such as the Green Climate Fund, Corporate Social Responsibility (CSR) programs, and impact investors.
[15] Roberts DG. 2014. Project Finance for Ocean Energy: Issues to Consider. http://www.icoe2014canada.org/wp-content/uploads/2014/11/1-RobertsDon_5-1.pdf

Table 1. Examples of recent bonds in the marine renewable energy sector.

Issuer	Description
Type: Certified Climate Bond (coupon 1.3%)[16] **Date:** 2017 **Value:** EUR 650M **Issuer/borrower:** Three Gorges Corporation	For wind projects, both offshore and onshore, in Germany and Portugal. Attracted investors from Germany, France, Switzerland, UK, Italy, Norway, Netherlands, Portugal, Spain, UAE, Singapore, South Korea, Japan and Malaysia.
Type: 10-year green bond (coupon 1.125%) **Date:** 2016 **Value:** EUR 1BN **Issuer/borrower:** Iberdrola	Proceeds will be used to finance and refinance onshore and offshore wind power projects in Spain, Portugal and the UK. Second opinion from Vigeo Eiris.
Type: Peer-to-peer funding (coupon 8%, term 5-year) **Date:** 2017 **Value:** GBP 4.3M **Issuer/borrower:** Atlantis Resources **Lender:** Peer-to-peer investors	To produce the next generation of subsea technology and progress more tidal power opportunities, including development of the second phase of MeyGen tidal project off the coast of Scotland.
Type: Debt finance **Date:** 2014 **Value:** GBP 7.5M **Issuer/borrower:** MeyGen **Lender:** Atlantis Resources / Scottish Enterprise Renewable Energy Investment Fund	For installation of four 1.5MW offshore tidal turbines and onshore infrastructure.[17]
Type: 5-year loan facility **Date:** 2014 **Value:** USD 20M **Issuer/borrower:** Carnegie Wave Energy Limited **Lender:** Clean Energy Finance Corporation	Commercial scale demonstration project for CETO array system (wave power units).[18] Revenue from sale of electricity and desalinated water.
Type: Green bond **Date:** 2016 **Value:** USD 1.1BN **Issuer/borrower:** TenneT IPO-TTH.AS (Dutch state-owned grid operator)	Investment in transmission cables from German offshore wind farms.[19]
Type: 5-year green bond (coupon 1.875%) **Date:** 2015 **Value:** USD 500M **Issuer/borrower:** Swedish Export Credit Corporation	For clean energy marine technologies (water and wastewater). Includes other renewable energy, energy efficiency, recycling, water, sustainable construction / materials / transport). Second opinion from CICERO.

In addition to existing bond issuances, potential climate bond issuers may derive useful insights from marine renewable energy initiatives that employ other finance and policy mechanisms. For example, Carnegie Wave Energy has secured £9.6m of EU funding to connect England's first commercial-scale wave power project to the grid. Commission of a 15MW array at the Cornwall wave hub center is planned for 2018 with commercial deployment in 2021.[20]

[16] This bond was Climate Bonds Certified before the Marine Renewable Criteria were approved by the Climate Bonds Standard Board. For this reason, it was eligible for certification under the Wind Criteria despite containing a mix of onshore and offshore wind projects. Once the Marine Renewable Energy Criteria are approved for Climate Bonds Certification by the Climate Bonds Standard Board, offshore wind projects will be evaluated using the Marine Renewable Energy Criteria as they better cover issues such as siting, which are relevant given their location in complex marine ecosystems.
[17] http://www.scottish-enterprise.com/knowledge-hub/articles/case-study/attract-investment/meygen
[18] http://www.cleanenergyfinancecorp.com.au/media/releases-and-announcements/files/cefc-finance-supports-innovative-australian-wave-energy.aspx; http://carnegiewave.com/wp-content/uploads/2016/01/160112_Quarterly-Report_FINAL-ASX-READY.pdf
[19] http://www.reuters.com/article/tennet-hldg-greenbond-idUSL8N18Z1R1
[20] https://www.theguardian.com/environment/2016/nov/09/eu-plans-320m-funding-boost-for-budding-ocean-energy-industry

Marine renewable energy investments with beneficial climate impacts

The Marine Renewable Energy Criteria are designed for certification of assets and activities that align with:

(i) A global economic transition that limits global warming to 2°C (ideally 1.5°C);
(ii) Adaptation and resilience to unavoidable climate change, which include addressing the conservation and sustainable use of the oceans, seas, and marine resources.

While global and regional projections of marine mitigation, adaptation, and resilience opportunities are available, investment opportunities need to be calibrated to specific geographic and sub-sectoral contexts with consideration of success factors such as socio-economic conditions, tenure arrangements, market access, and so on. Many companies have begun to invest in adapting their businesses and making them more resilient to climate change. However, it is generally recognized that investment mechanisms for climate change adaptation and resilience are at an earlier stage of development than mitigation mechanisms, which have been tested in a broader range of sectors and geographies.[21]

In its deliberations, the TWG carefully navigated trade-offs between eligibility Criteria that reflect a highly prescriptive or 'high bar' approach as opposed to an approach primarily focused on maximizing marine renewable energy related green bond issuances. The former could result in few actual issuances (e.g. by limiting the scope of potential issuances; by imposing high monitoring and reporting costs) while the latter risks weak environmental integrity and poor credibility.

Implications for eligibility Criteria for Marine Renewable Energy

How can Criteria meet the needs of bond issuers and investors?

To meaningfully grow the market, bonds in the marine sector should fit the needs of both investors and issuers. By determining the types of activities to finance through bonds, issuers will be key drivers for growth in the marine climate bond market, however potential bond investors can also drive the market's growth by signaling the types of investments they are eager to make.

For bond issuers, eligibility Criteria should:

- Allow a relatively wide scope for eligible activities;
- Indicate scientifically robust references and approaches for calculating climate benefits (e.g. guidelines for selecting among existing methodologies and tools);
- Cater to a range of potential issuers (and users of the guidance), including: (a) relatively large companies, including banks, that are able to aggregate across sectors and industries, (b) smaller companies and organizations, where there may need to be some aggregation and, or, concessional support, and (c) government agencies.

For bond investors, eligibility Criteria should promote bond issuances that are:

- Relatively straightforward, predictable, and easy to understand (e.g. in terms of the source and credibility of expected cash flows);
- Transparent regarding use of bond proceeds and intended impacts, allowing independent third-party scrutiny;
- Sizeable and liquid, and preferably rated.

[21] The UNFCCC (and associated IPCC guidance) encourages improving GHG measurement methodologies over time, while also stressing that time-series information must be comparable.

How can bond issuers use the Criteria?

To become certified under the Climate Bonds Standard, bond issuers must present evidence that their bond meets the requirements of the Climate Bonds Standard (currently version 2.1) and the relevant sector-specific Criteria. This evidence must be reviewed by a Climate Bonds Standard approved verifier, who then issues an assurance report that the requirements of the Climate Bonds Standard has been met. Issuers can then label their bond issuance as a Certified Climate Bond, on condition that they also provide post-issuance reporting (again supported by an approved verifier's report) of any amendments to the pre-issuance information. Issuers must also provide annual reporting thereafter including any further amendments as changes arise. For further information on the Certification process, please see Appendix 3 and the Climate Bonds Standard and Certification Scheme brochure available on the Climate Bonds website.

Bonds certified under Marine Renewable Energy Criteria must be used to finance assets and activities that promote: (i) GHG mitigation through reduced emissions or increased carbon sequestration; and (ii) adaptation to climate change and facilitate increased climate resilience in the social, economic, and environmental systems in which they are located. Issuers must also demonstrate compliance with disclosure requirements. Companies and other entities that seek to address GHG emissions and climate risks will need to generate reasonably accurate estimates of GHG emissions reductions and avoided risks and costs that result from adaptation and resilience investments. Bond issuers are encouraged to review relevant inventory information for their country and sectors.

Bond issuers may seek financing for projects that span multiple marine sub-sectors. For example, climate bonds could be part of the finance mix supporting Integrated Coastal Management, enabling local or national governments to finance (or re-finance) projects that enhance climate adaptation capacity and resilience. Also, there is emerging interest in linking offshore renewable energy production to offshore aquaculture or near shore renewable energy production to ports and associated infrastructure. Bond issuers may also seek financing for projects that span marine and other sectors. For example, they could seek to finance a mix of onshore and offshore renewable energy facilities. Appropriate multi-use financing is encouraged, but would have to meet requirements of all applicable Criteria such as Solar, Onshore Wind, Geothermal or those under development for Marine Fisheries, Aquaculture, and Coastal Infrastructure.

Use of bond proceeds should follow industry best practices that are based on scientifically credible sources and approaches. Bond issuers are encouraged to align investments with government plans and priorities including Nationally Determined Contributions (NDCs) under the UNFCCC (the TWG notes that, given significant country-by-country variation, strict requirements for adherence to host government targets may have unintended outcomes or create a non-level playing field). Alignment of use of bond proceeds with Marine Spatial Planning and other integrated approaches that evaluate development activities within a broader context is also strongly encouraged.

In this first iteration of the Marine Renewable Energy Criteria, the TWG seeks to offer tangible and objective Criteria for bond issuers and investors. This iteration will initiate early experience with balancing the objectives of large volume of bond issues and environmental integrity. It is planned that the Criteria will be reviewed one year after launch to take account of experience in practice and newly emerging science. This will allow for any gaps to be filled, inconsistencies to be clarified, and new scientific knowledge and available methodologies to be integrated to shrink the error bars around mitigation estimates, while remaining realistic about cost-effective measurement. Revised eligibility Criteria will not be retroactively applied to bonds already certified under an earlier version.

III. Discussion and establishment of eligibility Criteria

In developing the Marine Renewable Energy Criteria, the TWG reviewed a broad set of information sources and considerations. Throughout its work, the TWG has attempted to balance two over-arching objectives: (i) credibly verifying environmental outcomes of activities supported by bond issuances, and (ii) maximizing 'viable' bond issuances (i.e. eligibility Criteria are feasible for issuers to use and enable a wide range of suitable marine sector interventions). This section summarizes the information used to develop specific elements of the Criteria.

1. Specific features of the marine sector

All marine ecosystems are affected by human activity[22] and key drivers include energy development, coastal land use[23] (e.g. urbanization, watershed management), pollution (e.g. untreated effluents), ocean-based trade, and growing global food and energy demand.[24] Given the transboundary, interconnected nature of marine systems (and their interconnectivity with terrestrial systems), cumulative effects from a range of sectoral drivers are felt from coastal zones out to deep sea environments. Efforts at sustainable marine resource management are challenged by trade routes, ocean currents, and fisheries and migratory species that cross multiple jurisdictions and international waters. Integrated responses such as Marine Spatial Planning engage marine resource stakeholders in transparent assessment and siting of marine assets and activities.

While the marine sector is clearly an essential part of the global response to climate change, there are several features that differentiate it from other arenas for climate bond issuance.

Greenhouse gas emissions

Marine related sectors contribute to global GHG emissions, but also represent mitigation opportunities. Marine ecosystems can act as both sources of or as sinks for GHGs. Spatial variation in GHG emissions is very high, influenced by inherent ecosystems characteristics (e.g. different types of carbon pools) and management decisions. Temporal cycles in GHG emissions, linked to management and other factors, occur at multiple scales (e.g. annual, inter-annual). Impacts of natural events on rates of GHG emissions can be large (e.g. storms) and it is difficult to separate 'natural' and anthropogenic impacts.

Many companies operating in the marine sector are exploring how they can increase the efficiency of management in their direct operations and in the operations of their suppliers to reduce GHG footprints. Mitigation measures in marine related sectors can occur through renewable energy generation, reduced GHG emissions, emission efficiency, and carbon sequestration. Highly heterogeneous potential for GHG emissions and sequestration creates low certainty for net GHG emissions estimates. For example, net carbon sequestration by coastal carbon sinks has been estimated at 0.15 to 1.0 $GtCO_2$ per year.[25] Different carbon pools may be more or less vulnerable to future release to the atmosphere (as well as saturation of carbon uptake) and management activities may have long-term impacts (e.g. alteration of coastal systems may influence GHG emissions for many decades).

[22] Halpern et al. 2016. A Global Map of Human Impact on Marine Ecosystems. Science, 219:948-952.
[23] Silvestri S. Kershaw F. (eds.) 2010. Framing the Flow: Innovative Approaches to Understand, Protect and Value Ecosystem Services across Linked Habitats. Cambridge, UK: UNEP World Conservation Monitoring Centre.
[24] PEMSEA. 2015. Sustainable Development Strategy for the Seas of East Asia (SDS-SEA). Quezon City, Philippines: Partnerships in Environmental Management for the Seas of East Asia.
[25] Hudson and Glemarec. 2012. Catalysing Ocean Finance: Transforming Markets to Restore and Protect the Global Ocean. New York: UNDP-GEF.

Climate change impacts

Climate change is likely to have material impacts on communities and businesses within marine related sectors and investments to promote resilience are likely to be necessary. Appropriate investment in marine related sectors is critical for promoting adaptation to climate change and facilitating increased resilience for some of the world's most vulnerable ecosystems and human communities. Climate change threatens coastal resources and population centres, and is resulting in salinization of coastal agricultural and groundwater resources. Long-term financing is required to restore and protect marine resources and infrastructure.[26] The UN Development Programme has estimated that ~USD 5 billion in public investment will be needed in the next 10 to 20 years to combat degradation of coasts and oceans.[27]

The TWG has recommended that the Marine Renewable Energy Criteria include requirements for increasing the adaptation capacity and resilience to climate change of bond-financed assets. Efforts to increase adaptation capacity and resilience must recognize specific challenges in marine systems including:

- The potential impacts of changing sea level, precipitation, temperature, and other conditions on marine and coastal systems are highly diverse and may be severe.
- Ocean acidification represents a major disturbance to marine ecosystems especially food webs that support fisheries.
- The marine industry is concentrated in coastal regions that are often highly vulnerable to sea level rise and increasing storm severity will affect all onshore and offshore areas.
- Marine interventions have high relevance for adaptation efforts and importance for livelihoods and environmental integrity (e.g. biodiversity, watershed functioning, food and energy security and thus political stability).

2. Potentially eligible Marine assets and activities

In determining eligible uses of certified bond proceeds, it is important to recognize the wide variation across geographies and marine ecosystems as well as the complex mix of marine related assets and activities. The general Climate Bonds Standard approach is to create sectoral eligibility Criteria that are open to all assets and activities for which there is a credible, demonstrable climate benefit.

Which marine renewable energy assets are potentially eligible for certification?

A diverse array of technologies are being developed and deployed for marine renewable energy generation from wind, sun, ocean waves, currents, and tides as well as salinity and seawater temperature[28] gradients through hundreds of projects involving hundreds of different companies around the world.[29] Current technologies include:

- Offshore and near-shore wind and solar energy generation facilities
- In-stream tidal energy generation facilities (e.g. vertical or horizontal axis turbines, lagoons, barrage technologies, in-stream generators)[30]
- Energy generation facilities using waves, ocean current, river current, ocean thermals, salinity gradients, etc.

[26] Bos et al. 2015. Marine conservation finance: The need for and scope of an emerging field. Ocean & Coastal Management. 114: 116-128.
[27] Hudson and Glemarec. 2012. Catalysing Ocean Finance: Transforming Markets to Restore and Protect the Global Ocean. New York: UNDP-GEF.
[28] Primarily in equatorial areas, Ocean Thermal Energy Conversion (OTEC) generates consistent ('baseload') electric power through conversion of the temperature differential between surface and deeper waters. http://www.otecnews.org/what-is-otec/
[29] http://en.openei.org/wiki/Marine_and_Hydrokinetic_Technology_Database
[30] The probability of significant environmental disruption is considered to be low for in-stream tidal systems (i.e. bottom-mounted turbines in locations with rapid tidal flows) and redeveloped barrage systems (i.e. turbines inserted into existing tidal barriers or structures such as breakwaters), but, depending design, may be higher for new barrage systems and lagoon systems (e.g. negative effects on wetlands).

Located on shorelines, near-shore, or off-shore, floating attenuators, point absorbers, overtopping (reservoir) technologies, and other devices convert wave energy into electricity. Similarly, vertical and horizontal axis turbines on stream generators and barrage and lagoon technologies capture tidal energy, primarily in areas where the difference between low and high tide levels is great.[31] Offshore wind energy technologies, which can be bottom-mounted or on floating structures, are anticipated to undergo significant deployment in the coming years. OTEC offers important potential for application in developing countries. Floating solar photovoltaic technologies can offer higher performance compared to land-based installations (i.e. water provides better light reflection and panel cooling; less shading and dust accumulation).

Technology convergence has not yet occurred in this marine sub-sector and new applications continue to emerge (e.g. floating tidal installations; floating / underwater data 'farms;' wave power for carbon capture and storage; high voltage lines connecting offshore and onshore installations). Technologies vary in terms of capital costs, ratio of costs to power generation over a device's lifetime, and net capacity (i.e. ratio of actual to potential energy output)[32] as well as climate benefits and environmental effects. In addition to energy generation technologies, project developers may incur related capital costs for off-shore transmission infrastructure (e.g. transformers and backbone), on-shore support facilities (e.g. transmission terminus and transformers, turbines, grid connections, facilities for support vessels, equipment storage, onshore assembly etc.), and operational production or manufacturing or distribution facilities for key components, such as wind turbines and platforms.

Some marine renewable energy experts have indicated that the climate benefits of investments in mature technologies are primarily avoided GHG emissions, while for high-potential, but immature technologies, R&D investments would also contribute to advancing a whole subsector and, on that basis, could be attributed with a greater mitigation benefit. For example, a small-scale demonstration project might produce a relatively small GHG benefit (e.g. ~25GWh/year = 12,500 tonnes CO_2 per year), but also contribute to advancing fuller development of the marine renewable energy sector (e.g. displacing 2000 TWh/year of other generation = 1 billion tonnes CO_2/year). One caveat is that, unlike for land-based wind energy, there is little convergence on standard marine renewable energy technologies given the highly variable ocean environment (i.e. depth, bottom slope, sediments, water temperature, salinity). R&D focused on easily scaled marine renewable energy technologies and deployment and maintenance strategies may be most relevant. Another caveat is the difficulty of quantifying any additional mitigation benefit beyond GHG emissions avoidance.

Marine renewable energy deployment is linked to interest in secure, local energy sources to increase multi-scale energy security (e.g. local uses; diversified energy portfolio). Marine renewable energy facilities deliver mitigation by meeting existing and growing energy demands through a renewable (i.e. non-fossil fuel) source, although siting requires attention to potential threats to habitats and species (e.g. noise, vibrations, disturbance, cables, direct bird strikes). As it progresses from research and prototyping to commercial scale, marine renewable energy offers potential to meet power needs (e.g. 10% of the European Union demand by 2050).[33] In the UK, an estimated £100 million will be needed to bring 10 MW tidal energy arrays online and £200 million achieve commercial scale for wave energy.[34] Wave energy and possibly ocean thermal energy conversion (OTEC) can be a cost-effective method of

[31] http://www.hydro.org/tech-and-policy/technology/marine-and-hydrokinetic/; http://www.emec.org.uk/marine-energy/
[32] http://www.oceaneconomics.org/offshore_renewables/costs/
[33] Ocean Energy Europe. 2015. Draft Ocean Energy Strategic Roadmap, building ocean energy for Europe.
[34] Catapult. 2014. Financing solutions for wave and tidal energy. Glasgow, Scotland: ORE Catapult.

desalination in water- and infrastructure-limited areas (e.g. island nations, remote coastal areas) providing freshwater and power to move that water feasibly (i.e. without import of diesel or other fossil fuels).

The TWG recommends that the diverse set of existing marine renewable technologies be considered eligible for climate bond certification, including marine technologies that are not yet widely deployed, so long as they meet the specified eligibility Criteria. However, renewable marine energy linked to oil and gas platforms would not be eligible as these fossil fuel sectors are excluded under the Climate Bonds Standard.

What uses of bond proceeds are potentially eligible?

There are many different potential uses of bond financing:

Capital and operational expenses. Bond issuances are more commonly associated with capital expenditures ('capex') than with operating expenditures ('opex'), however it is certainly possible for bond structures to encompass operation and maintenance (O&M) costs. A combination of capex and opex may have relevance for marine renewable energy facilities. O&M may be central to achieving beneficial climate-related impacts, particularly in relation to climate resilience. The TWG has discussed the relevance to climate benefit (as opposed to financial viability) of specifying the allocation between capex and opex or requiring specific performance metrics. It has also considered the merits of requiring bond issuers to demonstrate that necessary O&M has been adequately planned for (even if opex is not part of the intended use of proceeds).

Acquisition or installation of new technologies is one type of capex expense. The outcomes associated with adoption of new technologies can vary based on the training and capacity of the people charged with operating these technologies as well as the caliber of oversight systems.

Production of inputs. For example, this could include manufacture of turbine blades or energy converters. In general, a green bond market seeking to finance more integrated responses to climate change will need to focus on full supply chains, whole product life cycles, and all major stakeholders. Supply chains vary dramatically in sourcing and structure and, to be eligible for certification, bond-financed assets and activities must be 100% dedicated to renewable energy generation.

Monitoring, compliance, and enforcement. Monitoring data are necessary both for efficient operation of marine assets (e.g. energy facilities) and to demonstrate compliance with regulations and certification schemes. Monitoring systems can be expensive and, in some cases, they are poorly implemented. The TWG has discussed how bond eligibility Criteria should accommodate investment in ocean observation buoys,[35] tsunami warning systems,[36] autonomous underwater vehicles, wave gliders,[37] and other monitoring equipment. These systems, often powered by small built-in wave or solar energy devices,[38] as well as innovations in data management, may offer improved effectiveness and lower costs and carbon footprint. Costs associated with regulatory compliance (e.g. demonstrating minimal impact from marine renewable energy siting), traceability, transparency, or enforcement will also require a clearly described connection to climate impacts if they are to be included as an intended use of certified bond proceeds.

Research and development (R&D) and technology. Investments in R&D and technology (e.g. piloting new marine renewable energy technologies) may be pivotal or peripheral to securing beneficial climate-

[35] Global Ocean Observing System - http://www.ioc-goos.org/
[36] http://www.bom.gov.au/tsunami/about/detection_buoys.shtml
[37] For example, drones are being deployed against illegal fishing in a massive marine reserve in the Pitcairn Islands (http://www.bbc.com/news/technology-35783564).
[38] Note that data buoy networks commonly require batteries and are left to sink at the end of useful life.

related impacts. As with human capacity investments, the TWG supports requirements that bond issuers demonstrate clear linkage between investments and climate mitigation and risk reduction.

Capacity building. Investments in human capacity for climate mitigation, adaptation, and resilience can be considered 'soft' investments, although human dimensions of supply chains and marine ecosystems are also recognized as critical to their functioning. For example, training and extension can be essential to effective application of marine spatial planning, coastal use zoning, vulnerability assessment, regulations and enforcement, ecosystem services valuation. Training facilities may represent a viable investment.[39] A definition of resilience that is constrained to biophysical assets and infrastructure – excluding human capacity – may deliver weaker outcomes. Where clear linkages can be described between human capacity building activities and beneficial climate-related impacts, the TWG supports their inclusion within eligibility Criteria (e.g. strengthening technical management skills; governance; monitoring and reporting capability).

Small-scale enterprise development. In developing countries and other contexts, natural resource based livelihood strategies represent a significant driver for environmental degradation and GHG emissions. There is a solid rationale for investment in assets and activities that support small-scale enterprise development that contributes to net climate benefits as an allowable use of certified climate bond proceeds.

Policy change and insurance. Public policies related to onshore and offshore resource use significantly affect the potential for climate mitigation (e.g. marine renewable energy permitting), adaptation and resilience through marine assets and activities. Policy change often represents an important lever for achieving climate benefits, however, debt finance is an unlikely instrument for enabling climate-smart policy shifts. Similarly, insurance schemes can be used to incentivize adaptation activities and to increase socio-economic resilience as well as indirectly enable sustainability investments (e.g. reduced insurance premiums for assets with increased resilience). In some cases, insurance schemes may be appropriate as minor components of bond financed projects.

Consumer demand. For example, this could include activities linked to utilities' interest in marine renewable energy. Shifting market signals and building industry awareness and interest can be an important precursor to mitigation, adaptation, and resilience investments. However, it may be challenging to directly link consumer demand expenditures with beneficial climate-compatible assets. Activities directed toward adoption of industry best practices and transparent reporting may represent more relevant use of bond proceeds.

Table 2. Examples of interventions to mitigate GHG emissions and / or increase climate adaptation capacity and resilience through marine renewable energy.

Interventions	Dimensions / considerations
Renewable energy generation facilities in marine systems	
Improve design / siting / upgrades to pilot and established facilities that offset fossil fuel based energy sources	* *Includes infrastructure capex and opex, transmission to the grid, manufacture of components, permitting costs, etc.* – Reduce GHG emission (e.g. due to ecosystem disturbance; operational design) – Improve climate resilience (to sea level rise; storms; seawater acidification) and ecosystem services (e.g. habitat restoration) – Maximize climate benefits (e.g. co-siting with oyster reefs)
Undertake R&D	– Develop / demonstrate more efficient or lower impact energy generation technologies

[39] For example, GreenWave operates a Seafood Hub in Fair Haven, Connecticut that aggregates, processes and markets ocean farm products and is creating a growers' co-op. http://greenwave.org/about-us/

	– Improve technologies and methods to support adaptation (e.g. to sea level rise) and reduce disturbance of marine habitats and species
Establish / improve monitoring, data management (i.e. collection, analysis, storage), and early warning systems	– Improve management knowledge to reduce losses from climate impacts

While there are important technological differences among the various forms of marine renewable energy generation, the set of necessary considerations for eligibility related to siting, manufacture, installation, operation, maintenance, and decommissioning are similar. Therefore, the TWG recommends that the Criteria adopt an integrated approach that is relevant to different types of marine renewable energy technologies.

In the original version of these criteria (published in 2018) the TWG did not recommend extending eligibility to vessels or vehicles used for installation of new or upgraded marine renewable energy sources (and similarly to grid expansion to accommodate them). However, following discussions held by the Shipping Criteria TWG, it was deemed that such assets should be kept within scope of these Marine Renewables criteria, and classified as eligible provided that they are dedicated to offshore wind power assets. The Climate Bonds Shipping Criteria (developed in 2020) has similarly included dedicated installation assets such as Wind Turbine Installation Vessels (WTIVs) and Jack-up Rigs as eligible. See page 16 of this document for further rationale on this issue.

Resulting Criteria

In general, marine renewable energy assets relate to: (i) the establishment, acquisition, expansion, and/ or ongoing management of a specified renewable energy facility, and (ii) the establishment, acquisition, expansion and/ or ongoing management of related inputs and infrastructure to support these facilities. These renewable energy facilities might include: Offshore wind facilities; offshore solar facilities; tidal power facilities (both tidal range and tidal stream); wave facilities; ocean current; OTEC (ocean thermal energy conversion); salinity driven energy facilities (e.g. using salinity gradients); and hybrids of the above.

These Criteria apply to projects or assets located in marine environments or estuaries. Similar technologies located in river environments, for example run-of-river hydropower, impoundment hydropower and pumped storage, will be eligible for Climate Bonds Certification under the Climate Bonds Hydropower Criteria.

Use of bond proceeds eligible under the Marine Renewable Energy Criteria include:

- Offshore wind or offshore solar assets that operate or are under construction to operate:
  - Offshore wind or offshore solar energy generation facilities
  - Transmission infrastructure and support facilities dedicated for renewable energy (e.g. transformers, backbone, transmission terminus, grid connections, dedicated facilities for support vessels and vehicles, equipment storage, onshore assembly)
  - Assets dedicated[40] for supporting offshore RE infrastructure, such as Wind Turbine Installation Vessels (WTIVs) and Jack-up rigs.[41]

[40] In this particular case, "dedicated" means the asset is to be used only for the purposes of installation and operation of offshore wind energy facilities and nothing else. Assets used for purposes other than installation and operation are not eligible. Please refer to the footnote on page 14 for verification guidance.

[41] For Certification of WTIVs or Jack-up Rigs dedicated to the installation and operation of offshore wind energy assets, during pre-Certification, verifiers should ascertain that the vessel will be used solely for the installation, operation, maintenance or decommissioning of renewable energy assets only. Those assets that also work in other sectors (e.g. Oil and Gas industry) are not eligible. If this is not available before issuance, then verifiers must ensure on an annual, post-issuance reporting basis, that the asset(s) have only been leased or operated for offshore wind energy installation/operation. This can be done through verification of receipts or accounts payable, against the overall revenue earned attributed to the asset.

- Tidal power; range and stream assets that operate or are under construction to operate:
  - Tidal energy generation facilities (e.g. turbine housing, turbines, causeway)
  - Dedicated transmission infrastructure and support facilities (e.g. transformers, backbone, transmission terminus, grid connections, dedicated facilities for support vessels and vehicles, equipment storage, onshore assembly)
  - Dedicated operational production or manufacturing or distribution facilities for key components
- Wave assets that operate or are under construction to operate:
  - Wave energy generation facilities (e.g. floating attenuators, point absorbers, overtopping / reservoir technologies, oscillating water columns)
  - Dedicated transmission infrastructure and support facilities (e.g. transformers, backbone, transmission terminus, grid connections, dedicated facilities for support vessels and vehicles, equipment storage, onshore assembly)
  - Dedicated operational production or manufacturing or distribution facilities for key components
- Other – using ocean current, river current, ocean thermals, salinity gradients etc assets that operate or are under construction to operate:
  - Energy generation facilities
  - Dedicated transmission infrastructure and support facilities (e.g. transformers, backbone, transmission terminus, grid connections, dedicated facilities for support vessels and vehicles, equipment storage, onshore assembly)
  - Dedicated operational production or manufacturing or distribution facilities for key components

Assets and projects not (yet) eligible for Certification under these Criteria include:

- Dedicated operational production or manufacturing or distribution facilities for key components, such as wind turbines, platforms, etc. are eligible under the Climate Bonds Standard Wind Criteria.
- Dedicated operational production or manufacturing or distribution facilities for key components, such as solar panels, etc. are eligible under the Climate Bonds Standard Solar Criteria.
- Land-based Installation vehicles: If an issuer wishes to include installation vehicles in the bond issuance, the vehicles must comply with the Climate Bonds Standard Low Carbon Transport Criteria. They are not automatically eligible under dedicated support facilities (note that this does not apply to waterborne installation vessels).
- River based hydropower, such as run-of-river hydropower, impoundment hydropower and pumped storage: River based hydropower assets are not eligible for Climate Bonds Certification under the Marine Renewable Energy Criteria. If an issuer wishes to include these assets in the bond issuance, they must comply with the Climate Bonds Standard Hydropower Criteria.

3. Foundation for disclosure requirements

Transparency has emerged as a core principle of the global response to climate change. Companies and financial institutions are increasingly aware of the need to increase transparency regarding climate related risks to their operations and portfolios in response to growing expectations from their customers, business partners, investors, and regulators.[42] In the green bond market, impact reporting by issuers is on the rise.[43] Over time, bond investors are likely to require transparent demonstration of material climate benefits (i.e. GHG mitigation; climate risk reduction) and third party verification.

Part of the value associated with Climate Bonds Certification is increased transparency regarding use of proceeds, an important step in shifting norms within the bond market overall. The Climate Bonds

[42] EIU. 2017. No more excuses: Responsible supply chains in a globalised world. London, UK: The Economist Intelligence Unit Ltd.
[43] Climate Bonds Initiative. 2017. Post-issuance reporting in the green bond market. London, UK: Climate Bonds Initiative

Standard aims to promote transparency on intended use of proceeds and independent review of baselines and proceeds management, thereby holding issuers accountable for bond-financed assets and activities.

Resulting Criteria

In the interests of transparency and disclosure, issuers of Certified Climate Bonds are required to publicly disclose the following in respect of the assets and use of proceeds incorporated in that issuance:

- Project location and size, including description of marine and coastal ecosystem in proximity to planned installations, noting for example whether in marine protected areas or vulnerable marine ecosystems;
- Projected lifespan of the asset/project;
- Key stakeholders involved, including other users of the area and surrounding area (sea, land or air depending on what is applicable) of the facility(ies);
- Description of project activities including details on installation, operation and decommissioning activities;
- Expected/current facility capacity and generation during and after the life of the bond;
- Details of where the energy generated is being fed into, and estimated impact on grid mix;
- Projected avoided GHG emissions compared to fossil fuel counterfactual (in kgCO2e) using recognised conversion factors;
- The planning standards, environmental regulations and other regulatory regulations that the project has been required to comply with.

Where the bond portfolio includes several separately identifiable projects or groups of assets, these conditions must be met for each separately identified project or asset grouping. Bond issuers should determine these project boundaries, which may be based on geographical linkages.

4. Foundation for Marine Renewable Energy mitigation Criteria

To be certified under the Climate Bonds Standard, a bond issuance must promote mitigation through directly or indirectly reduced GHG emissions, emission efficiency (i.e. fewer GHGs emitted per unit of production), and/ or direct or indirect carbon sequestration (e.g. carbon uptake marine ecosystems).

Use of bond proceeds should be expected to be in alignment with a transition to a low-carbon global economy that limits global warming to 2°C, ideally 1.5°C. Certification may be suitable for financing (or re-financing) assets and operations that are already meeting these expectations as well as for those that will improve performance through bond financing.

What is the rationale for automatic eligibility of marine renewable energy for the mitigation component of the Criteria?

Marine renewable energy facilities deliver mitigation by meeting existing and growing energy demands through a renewable (i.e. non-fossil fuel) source and are part of the necessary global transition from a fossil fuel based energy economy.[44] As these facilities enable the switch away from high-emitting fossil fuel energy sources, they deliver significant mitigation impact through the displacement of higher GHG emitting electricity generation towards a 'low GHG power' supply.

The GHG emissions associated with installation and operation of marine renewable energy facilities are considered to be immaterial relative to the fossil fuel related GHG emissions offset over the timeframe of their anticipated deployment. For example, the clean energy generated by low carbon offshore wind energy installations amply compensates for the GHG emissions associated with production,

[44] For example, onshore windfarms in China were found to deliver a 97% reduction in CO2 emissions relative to coal-based energy generation (Xue B et al. 2015. A lifecycle co-benefits assessment of wind power in China. Renewable and Sustainable Energy Reviews, 41:338–346).

manufacture, and installation (e.g. offshore foundations, submarine cable),[45] despite these being higher than for onshore wind facilities.[46] Therefore, the TWG recommends that marine renewable energy facilities be considered as automatically meeting the mitigation component of the Marine Renewable Energy Criteria.

For operational continuity when renewable energy systems are offline, limited fossil fuel back-up capacity may be allowable for powering monitoring and operating equipment, resilience or environmental protection measures, and restart capability.

In line with existing Criteria for onshore wind and solar energy, associated infrastructure fully dedicated to renewable energy generation (including dedicated transmission lines connecting installations to the grid) is also eligible for certification[47] Likewise, manufacturing facilities and related assets and activities that are fully dedicated to marine renewable energy technologies may also be eligible for climate bond certification. This includes custom-built platforms, generation devices (e.g. turbines, blades), and specialized submarine cables.

How does this link to the above disclosure requirement on GHG emissions?

Despite the automatic eligibility of marine renewable energy assets under the mitigation component of these Criteria, the disclosure component (discussed in the section above) does still require issuers to demonstrate that the projects financed deliver net GHG reduction relative to business as usual. This requirement is included in recognition of the value of this information to investors.

Issuers are expected to benchmark their emissions performance against comparable sectoral best practice. In general, performance standards specify efficiency metrics, (e.g. tons of carbon emitted per unit of production) that represent best practice for specific economic sectors. For marine renewable energy, a relevant metric will be avoided fossil fuel use measured in CO_2-equivalent.

Energy and transport related sectoral Criteria under the Climate Bonds Standard have made use of technology-based benchmarks, emissions profiles, and decarbonization scenarios provided by the International Energy Agency (IEA) in establishing performance standards required for certification. For the Marine sector (as well as the Land Use sector), there is no comparable international standard-setting agency. An overall mitigation resource is the Greenhouse Gas Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), which specifies standards for how to measure, manage, and report GHG emissions (although avoided emissions are not addressed).[48]

Resulting Criteria

All eligible marine renewable energy assets automatically meet the Mitigation requirement of the Climate Bonds Standard, provided that:

- The asset is100% dedicated to renewable energy
- Any fossil fuel back up in place is limited to:
  - Powering monitoring, operating and maintenance equipment in the event of no renewable power in the system
  - Powering resilience or protection measures in the event of no renewable power in the system
  - Restart capability

[45] Wagner H-J et al. 2011. Life cycle assessment of the offshore wind farm alpha ventus. Energy, 36: 2459-2464.
[46] Schleisner L. 2000. Life cycle assessment of a wind farm and related externalities. Renewable Energy, 20: 279-288.
[47] This requirement is consistent with the Solar and (onshore) Wind Criteria of the Climate Bonds Standard.
[48] http://www.ghgprotocol.org/ Articulates key principles including relevance, completeness, consistent methodologies, transparency, and accuracy.

5. Foundation for Marine adaptation and resilience Criteria

How are adaptation and resilience defined?

Operational definitions of climate adaptation and resilience continue to evolve in response to real-world experience.[49] As the market for 'green' investment grows, sectoral definitions will become increasingly important for ensuring that investors are directing capital toward meaningful climate change responses.

Defining climate adaptation. Given the reality of significant unavoidable climate change, there is a clear need for major public and private sector investment in adaptation capacity in all regions and economic sectors. The International Panel on Climate Change (IPCC) defines climate change adaptation as "*The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.*" [50] The UN Environment Programme defines private sector adaptation as "*any activity which a private actor pursues that is performed differently when compared to a counterfactual world without climate change*."[51]

Adaptation needs in the marine sector will vary by region, by sub-sector, and by many other factors especially the nature of climate impacts (e.g. changing weather; sea level rise; ocean acidification; severe storms). Marine and coastal systems are highly diverse in terms of the exposure and vulnerability of onshore and offshore areas to climate change, including the likelihood of gradual degradation, episodic disturbances, or regime alterations. The focus of adaptation efforts will commonly include ecosystem services (e.g. preventing salinization of water supplies), built infrastructure and population centers, and biodiversity (e.g. food webs that support fisheries).

Defining climate resilience. Resilience is defined by the IPCC as "*The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.*" Resilience has also been described as "*the ability of people, communities and institutions to prepare for, withstand, and bounce back more rapidly from acute shocks and chronic stresses*."[52]

Increasing resilience requires defining 'what will be more resilient to what?' Different bond issuing entities (e.g. public, private) and technical experts will hold different conceptions about resilience targets and objectives. Targets of resilience-building efforts could include ecosystem service flows, natural capital stocks, communities, companies, jurisdictions, sectors, supply chains, et alia. The climate impacts that are the focus of resilience-building efforts could be defined as altered weather patterns, extreme weather events, degraded ecological conditions, and other direct stressors to marine assets as well as indirect stressors such as market shifts (in global commodity prices) that result from climate impacts at different scales or in different regions.

How should issuers address adaptation and resilience of marine renewable assets and activities?

To be certified under the Climate Bonds Standard, a bond issuance must promote adaptation to climate change and facilitate increased climate resilience in the systems and areas where bond proceeds are used. Bond issuers are expected to anticipate and reduce risks that future or accelerated climate change will negatively affect bond-financed marine assets. Inadequate investments can lead to wasted resources and missed opportunities if investments are unable to withstand future climate changes.

---

[49] For example, see work by the Resilience Alliance and the Stockholm Resilience Center.
[50] IPCC. 2014. Summary for Policymakers on "Impacts, Adaptation and Vulnerability." http://ipcc-wg2.gov/AR5/images/uploads/WG2AR5_SPM_FINAL.pdf
[51] UNEP. 2016. Demystifying adaptation finance for the private sector. Nairobi, Kenya: United Nations Environment Programme.
[52] Judith Rodin. 2014. https://www.rockefellerfoundation.org/blog/realizing-resilience-dividend/

Despite ongoing scientific efforts, there is non-trivial uncertainty in estimates of climate change impacts to marine ecosystems. This makes it difficult for marine asset managers to make appropriate near- and long-term plans for sustainable operations (and complicates development of Criteria to bond issuers). Yet, there are potential climate risks that could upend anticipated benefits resulting from mitigation, adaptation, and resilience activities. As sea levels rise, marine assets in coastal zones may become 'stranded' and any climate adaptation investment that doesn't sufficiently account for this process could be lost.

Understanding the assets that will be required to meet climate change impacts is therefore an important part of the Climate Bonds Initiative's efforts to develop sectoral eligibility Criteria. The TWG recommends that bond issuers use best available estimates to fully state potential climate impacts (including estimates of error) and how asset owners will mitigate these risks.

Issuers are expected to demonstrate that they have adequately anticipated current or future risks to the structural integrity and continuous operation of bond-financed renewable energy facilities (e.g. platforms, turbines, transmission cables, transformers, onshore infrastructure) including sea level rise, changing patterns of wind or water movement, altered water chemistry or temperature, extreme events such as floods or storms (i.e. frequency or intensity). Drawing on scientifically robust climate information, modeling, and scenarios, issuers should understand the nature of climate related risks and present plans for monitoring, mitigating, and adapting to these risks (e.g. management capacity; maintenance programs; contingency plans). These plans should align with jurisdictional adaptation plans.

How should issuers address adaptation and climate resilience of ecosystems and communities?

Improved adaptation capacity and climate resilience is expected for both bond-financed assets and activities as well as the contribution these assets or activities make to increasing the climate resilience of local or regional ecosystems and communities. Issuers are required to demonstrate that potential negative impacts that can result from marine renewable energy facilities (on directly affected sites and on adjacent or indirectly affected sites) have been assessed and mitigated. These include disruption or harm to:

- At-risk or endangered species or habitats (e.g. noise, vibration, collision, new electromagnetic fields from transmission cables)
- Ecosystem services including water circulation, sediment transport, and other physical flows (e.g. sea bed disturbance)
- Resilience of other users of the marine and coastal space or relevant stakeholders or communities

Bond issuers should make explicit reference to climate adaptation capacity and resilience of specific localities and conditions (e.g. biodiversity, habitats,[53] human communities), including future or emerging climate conditions.

Protecting or enhancing ecosystems. While marine renewable energy represents an exciting new energy source, siting of converters (and their mooring lines, power cables, etc.) must be done carefully to minimize impacts on marine life.[54] Risks are likely to be greater for device arrays compared to single devices. Noise and vibration generated by installations may disrupt animals, such as marine mammals, fish, birds, turtles, and invertebrates that rely on sound for navigation and other essential functions.[55] The potential for collision-related injury or mortality is a key parameter for impact assessment, particularly for

[53] Refer to UN Convention on Biological Diversity, SDG commitments and indicators, Ocean Health Index, environmental and social safeguards used by the Asian Development Bank, and PwC's Total Impact and Management and Measurement (TIMM) methodology that looks at environmental, social, economic, and tax impacts.
[54] Polagye et al. 2014. Instrumentation for Monitoring Around Marine Renewable Energy Converters: Workshop Final Report. PNNL-23110 Pacific Northwest National Laboratory, Seattle, Washington.
[55] Copping A et al. 2016.

tidal energy projects. Some studies indicate higher turbine collision risk for larger fish.[56] Alteration of water circulation, sediment transport, and other physical flows by marine renewable energy devices as well as introduction of new electromagnetic fields (e.g. via suspended or seafloor cables) may negatively impact habitat quality.[57] Development of feasible instrumentation has focused on monitoring interactions of marine animals with energy devices, animals' distribution and habitat use, and sound issues.[58]

Siting of marine renewable energy facilities can encounter competition with ecologically sensitive areas, shipping lanes, commercial fisheries, and military zones as well as recreational and other uses.[59] As a relatively new set of technologies, limited data regarding environmental impacts (i.e. marine animals, habitats) of installations generates uncertainty and slows siting and permitting processes, inhibiting cost-competitiveness with other electricity sources.[60] Scientists and marine renewable energy proponents encourage 'retirement' of monitoring requirements for risks demonstrated to have low probability of harm, on a project-specific basis.[61] The US Department of Energy and its partners operate the Tethys online knowledge portal for studies of marine renewable energy environmental effects.[62] Environmental studies for marine renewable energy have predominantly evaluated wave energy converters and tidal turbines.[63]

Marine renewable energy installations (including underwater cables) have a clear climate benefit (i.e. GHG reduction). However, these installations may also present risks to local ecosystems and / or pelagic and migratory species and face risks from storms, sea level rise, and other climate impacts. While the high environmental standards (through permitting, regulatory processes, and due diligence) being applied to marine renewable energy deployment in many places should result in alignment with government, industry,[64] and scientific guidance and exclusion of projects with significant impacts or risks, there may be important variation in the existence or rigor of such processes among countries. Regulatory compliance costs constitute a material constraint to establishing commercially viable facilities. Costs include pre-permitting data gathering, siting and permitting, long-term monitoring of potential effects, and decommissioning. Limited data about multi-year deployment and operational costs of marine renewable energy at commercial scale is a challenge for confirming that deployment replaces fossil fuel energy generation (i.e. results in real mitigation). In the case of marine renewable energy, compliance costs are likely to be an essential hurdle to producing renewable tidal or hydrokinetic energy.

The TWG considered excluding bottom-mounted (i.e. anchored to the seabed) marine renewable energy facilities, which are more energy-intensive and disruptive to install than floating structures, although not necessarily more so than onshore renewable energy facilities. Noting that floating structures are anticipated to dominate future deployment,[65] the TWG recommends that bottom-mounted technologies be eligible if compliance with screening Criteria (discussed below) is demonstrated.

Issuers are also expected to anticipate and reduce risks posed by other sectoral activities that could negatively affect bond-financed marine assets. For example, concerns have been raised that

---

[56] Hammar et al. 2015. A Probabilistic Model for Hydrokinetic Turbine Collision Risks: Exploring Impacts on Fish. PLoS ONE 10(3): e0117756.
[57] Copping A et al. 2016.
[58] Polagye et al. 2014. Instrumentation for Monitoring around Marine Renewable Energy Converters: Workshop Final Report. Richland, Washington: Pacific Northwest National Laboratory.
[59] Tierney SF. 2013. Planning for energy development: How Marine Spatial Planning could improve the leasing/permitting processes for offshore wind and offshore oil/natural gas development. Analysis Group, Inc.
[60] Copping A et al. 2016.
[61] Polagye et al. 2014. Instrumentation for Monitoring around Marine Renewable Energy Converters: Workshop Final Report. Richland, Washington: Pacific Northwest National Laboratory.
[62] http://tethys.pnnl.gov/knowledge-base-marine-energy; http://tethys.pnnl.gov/map-viewer-marine-energy
[63] Copping A et al. 2016. Annex IV 2016 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World.
[64] Refer to Offshore Renewables Joint Industry Program
[65] https://www.boem.gov/Offshore-Wind-Energy/

establishment of marine renewable energy facilities could have potential impacts on fisheries and fishing communities. Similarly, weak governance (e.g. in transboundary areas; of open access fisheries) can pose a threat to the integrity of bond-financed assets. Relatedly, poorly designed adaptation and resilience investments that create localized benefits could trigger negative effects off-site (e.g. storm surge impacts). The TWG recommends that bond issuers outline major categories of risks (e.g. policy, governance, technology) and risk mitigation strategies.

Installation and operation of marine renewable energy facilities produces construction waste and pollutants such as oil-based lubricants. At the end of useful deployment, marine renewable energy facilities must be decommissioned in an environmentally responsible manner. To be approved for climate certification, bond issuers are required to present plans for appropriate management of all waste, pollutants, and decommissioned infrastructure (including recycling, as appropriate). These plans should be aligned with all relevant jurisdictional rules.

Protecting or enhancing communities. Deployment or upgrades to marine renewable energy facilities must protect or enhance the adaptive capacity and climate resilience of the socio-economic systems in the areas where bond proceeds are used. Issuers should demonstrate that relevant localities and human communities are resilient and that adaptation capacity is sufficient to current and future climate impacts.

As part of pre-issuance reporting, issuers are expected to present information indicating how bond-financed assets and activities protect or enhance adaptive capacity and resilience of other marine uses or stakeholders in affected areas including any cumulative impacts of all existing and planned energy generation facilities (e.g. alteration of water or sediment flows). To be approved for climate certification, bond issuers are required to present plans for effectively managing and minimizing conflict with other users of the marine and coastal space including alignment with marine spatial plans and compliance with jurisdictional rules and regulations. Issuers are encouraged to engage actively with other marine stakeholders and to collaborate in planning for multiple uses, hazard response, and post-event recovery.

How can bond issuers comply with adaptation and resilience requirements?

To demonstrate that certified climate bond financing delivers improved adaptation capacity and resilience, issuers would ideally benchmark their performance against comparable sectoral best practice. However, at this stage, there is inadequate agreement on definitions and best practices and universal benchmarks are not generally available. In many cases, investments designed to last for decades will most usefully undertake adaptation by anticipating multiple future scenarios and optimizing for long-term flexibility. Where there are limits in knowledge for establishing clear guidance, managing for flexibility and uncertainty (including uncertainty of uptake by industry) may be an optimal strategy.

Given the uncertainty of climate impacts for different areas and assets, it is not feasible to require issuers to demonstrate that bond-financed assets and activities have resulted in adaptive and resilient outcomes. Therefore, the TWG recommends a process-based approach to demonstrating compliance with adaptation and resilience Criteria. If issuers can demonstrate that their use of bond proceeds meets all Criteria requirements using credible methodologies, they can be considered to have met the Marine Renewable Energy Criteria. Issuers should also specify the timeframe by which percentages of the bond portfolio comply with eligibility with Criteria and monitoring and reporting requirements. Timing should be aligned with any available, credible projections of climate risk (e.g. sea level rise).

Alignment with science, best practices, and government plans. Demonstrating compliance with adaptation and resilience Criteria should be linked to science-based targets (e.g. Aichi Biodiversity Goals by the Secretariat of the UN Convention on Biological Diversity) and international, regional, or national industry standards (recognizing that actual feasible outcomes will depend on local context and the non-trivial challenges of setting appropriate targets). Regulations and industry best practices may provide appropriate baselines for adaptation and resilience activities as might tools for ecosystem valuation, socio-economic assessment (e.g. household income; employment), and vulnerability or risk assessment.

Bond issuers can refer to national-level adaptation planning to understand major opportunities and constraints for climate-smart marine projects in the regions where they operate.

The TWG reviewed the utility of requiring bond issuers to undertake a vulnerability assessment related to the areas where bond proceeds would be used. Such assessments survey and integrate components of vulnerability (i.e. the combination of exposure, sensitivity and adaptive capacity) to support adaptation decisions.[66] Available methodologies for vulnerability assessments are highly varied and there are gaps for many relevant environmental features. Therefore, the TWG does not recommend requiring vulnerability assessments be undertaken by bond issuers. Rather, an adaptation and resilience checklist or scorecard should be developed for based on specific biophysical and other considerations (see Sections IV-VII).

Resilience improvements might also be measured against a baseline of current productive use of marine assets and ecosystems (i.e. productive use continues despite increasing climate stressors). New scoring tools are emerging that may provide an integrated baseline for climate risk (e.g. combined risks of storm surge and tidal, fluvial, and rainfall induced flooding). Other resources for adaptation and resilience include: (i) the Sendai Framework for Disaster Risk Reduction, approved by over 200 countries and the United Nations General Assembly in 2015, which establishes a global, voluntary, multi-sector framework to disaster risk reduction;[67] (ii) the Global Assessment Report (GAR) 2015, produced by UNISDR, which evaluates risk exposure to the built environment globally.[68]

Alignment with existing certification schemes. In general, certification schemes are designed to provide internationally credible standards that deliver sustainability outcomes. The TWG has found that the existing set of certification schemes in the Marine sector do not adequately address important aspects of climate change mitigation, adaptation, and resilience nor do they cover the full range of technologies, regions, asset classes, and activity types.

There are efforts underway to develop international standards for marine renewable energy by groups such as the International Electrotechnical Commission (IEC)[69] and the Ocean Energy Systems Technology Collaboration Programme.[70] However, at this stage, there no internationally relevant best practice standards for marine renewable energy that can be used as proxy standards for climate bond certification. Therefore, issuers will need to directly demonstrate compliance with adaptation and resilience Criteria. The Criteria include a checklist of adaptation and resilience considerations that issuers must adequately address by providing pre-issuance information regarding processes and plans for the design, implementation, and decommissioning phases of bond-financed assets and activities.

Resulting Criteria

Adaptation and climate resilience is a consideration for marine renewable energy facilities in a variety of respects. For example, offshore renewable projects will need to be robust in structure to cope with changing wave heights whilst effective in capturing the energy from more severe stormy conditions. In addition, as uses of the sea intensify (some of these driven by climate induced changes, for example increased renewable energy from the seas), there may be greater competing demands for the limited space available. However, there are no globally adopted best practice standards for addressing and assessing the adaptation and resilience risks and opportunities associated with marine renewable energy. Therefore, we have established here a checklist that aims to provide a basic check that the issuer has appropriately considered these issues and opportunities in both the design and the ongoing

[66] Ellison J. 2012. Climate Change Vulnerability Assessment and Adaptation Planning for Mangrove Systems; Adaptation approaches for key species; Implications for water management institutions
[67] http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf
[68] http://www.preventionweb.net/english/hyogo/gar/2015/en/home/documents.html#working_papers
[69] The IEC has a technical committee working on design and performance of wave, tidal and other marine current converters. http://www.iec.ch/dyn/www/f?p=103:7:0::::FSP_ORG_ID,FSP_LANG_ID:1316,25
[70] The OES is an intergovernmental collaboration between countries, which operates under a framework established by the International Energy Agency. https://www.ocean-energy-systems.org/

management of the assets and projects. (N.B. Wave devices may not be designed to capture severe stormy conditions, but rather to disengage to save the hardware.)

To demonstrate compliance, all bond-financed assets and activities must satisfy the requirements of the checklist detailed in Table 3. The checklist is a tool to verify that the issuer has implemented sufficient processes and plans in the design, planning, and decommissioning phases of a project to ensure that the operation and construction of the asset minimizes environmental harm and the asset is appropriately adaptive and resilient to climate change and supports the adaptation and resilience of other stakeholders in the marine environment.

All elements of this checklist must be addressed, and appropriate evidence provided that these requirements are being met, or are not applicable in respect of the specific assets and projects linked to the bond. It is expected that their evidence will encompass a range of assessment and impact reports and associated data, including but not limited to those reports required to meet national and local licensing and approval processes. This might include Development Consent Orders, planning regulations adhered to, Environmental Impact Assessments, Marine Spatial Plans, Vulnerability Assessments and associated Adaptation Plans.

Table 3. Adaptation and resilience checklist.

Section	Requirements
1. The issuer understands the climate related risks and vulnerabilities to the asset/ site	1.1 Processes are in place (as part of both the asset design and ongoing management) to assess key risks to the assets from a changing climate and its impact on marine conditions. These key risks should include the following, plus any others felt to be of concern for the operation of these assets. The risks should be identified and interpreted in terms of the impact on the asset and the related effects for the business (e.g. impact on operating feasibility and schedules and potential system outages, impact on maintenance requirements). For all facilities: • Sea level rise and storm surge • Extreme precipitation and flooding • Increase in geophysical hazards such as earthquakes, tsunamis, volcanic eruptions and landslides • Changes in wind and storm patterns and intensity • Changes in ocean temperature, currents and salinity levels The issuer understands what level of climate change would mean the asset/site is no longer viable, and understands under which climate change scenarios this would happen. These processes and assessments use climate information, modelling and scenarios based on peer reviewed methodologies and literature and considering the variability in modelled scenarios. If a project does not have any climate related risks or vulnerabilities evidence must be given to show how this was determined.
2. The issuer understands the improvements and impacts in the larger context (spatially and temporally) beyond the asset/ site. (i.e. the impacts of their own assets and activities on the broader ecosystem and stakeholders in that ecosystem)	2.1 Processes are in place (as part of both the asset design, ongoing operation and decommissioning) to assess the improvements and impacts the asset has on the resilience of other stakeholders in the system in which it operates. These assessments address: • Any ways in which renewable energy facilities might affect, both positively and negatively, the climate resilience of other marine users or relevant/local stakeholders/communities; • Any ways in which renewable energy facilities improve the adaptation capacity of other marine users or relevant/local stakeholders/communities. For example: (i) any potential impacts on other marine stakeholders of a highly dense concentration of renewable energy facilities or associated transmission lines; (ii) any potential impacts that renewable energy facilities may have on coastal resilience by taking strength out of the wind, waves, tidal flows, tidal range or by altering sedimentation processes. If a project does not have any impacts beyond the asset / site evidence must be given to show how this was determined.

Section	Requirements
3. The issuer has designed and implemented strategies to mitigate and adapt to these climate risks and vulnerabilities	3.1 An adaptation plan has been designed and is being implemented to address the risks identified in assessments outlined above. All risks identified are being addressed in the design and management of the asset. The issuer has: • designed or amended asset maintenance plans to ensure that scheduled maintenance is sufficient to cope with the ongoing impacts of climate change and a plan has been established to govern how they approach emergency maintenance needs arising from sudden climate change impacts (e.g. extreme storms); • remotely controlled or automated shutdown procedures, training, capacity and governance arrangements in place to manage the impacts of exceptional events (such as extreme storms, winds etc.); • monitoring and reporting systems and processes to identify high risk scenarios; • contingency plans to address disruptions to operations or loss of the asset and any resulting environmental or social damage; • processes for feeding risk assessments back into decision making; • a budget allocated to implementing the adaptation plan and has a named member of staff responsible for its implementation; • complied with any existing broader or higher-level adaption plans, such as NAPAs. 3.2 Inspections are carried out regularly and there is a maintenance regime in place for future inspections with evidence that this is adhered to.
4. Issuer is pursuing strategies that promote resilience and adaptation across the area in which it operates and beyond	4.1 Issuer is involved in stakeholder engagement and collaboration (e.g. policy development, consultation, collaboration and active engagement with other marine users). For example: • Engaging in hazard response planning for the area, or recovery planning and operations after severe events; • Pursuing potential climate resilience benefits for the local area that could be delivered by the marine renewable energy facility, such as a tidal lagoon providing additional storm surge protection for local towns; • Alterations made to day-to-day operating procedures in response to stakeholder engagement.
5. Issuer is delivering positive impacts (or no harm) in terms of key sustainability indicators that will support climate resilience in the marine environment	5.1 The asset or project does not put in jeopardy at risk or endangered species or habitats or unduly impact ecosystem services. Where there are possible negative impacts to habitats, species, biodiversity, or ecosystem services, mitigation measures are implemented to offset the negative impacts (e.g. noise and vibration generated by marine renewable energy arrays may disrupt animals, such as marine mammals, fish, birds, turtles, and invertebrates that rely on sound for navigation and other essential functions). The potential for collision-related injury or mortality of marine animals is a key parameter for impact assessment, particularly for tidal energy projects. Alteration of water circulation, sediment transport, and other physical flows by marine renewable energy devices as well as introduction of new electromagnetic fields (e.g. via suspended or seafloor cables) may negatively impact habitat quality. This might be especially relevant for tidal barrage, but should be considered for all marine renewable arrays. 5.2 Waste is responsibly dealt with, including appropriate disposal of construction waste and oil-based lubricants, including recycling options where possible. Also, recycling where possible of equipment after decommissioning. 5.3 The issuer has recognised and listed the potential risks for accidental site contamination either from leakage of hydraulic fluid (or any other potential pollutant) or from wreckage / debris on the sea bed. Demonstrable steps have been taken to minimise these risks and plans have been made for clean-up should a site contamination event occur. 5.4 Decommissioning of the plant is planned in a way that considers the environmental impacts. 5.5 Issuer has plans and processes in place to effectively manage and minimize conflict with other users of the marine and coastal space.

6. Alignment with other sectoral Criteria

What are the boundaries with other sectoral Criteria?

As new sectoral Criteria are developed under the Climate Bonds Standard, there is an ongoing effort to ensure a consistent approach even as new types of eligibility considerations emerge. Sectoral boundaries can be indistinct, possibly creating confusion for bond issuers seeking climate certification. Issuers of marine sector bonds will be entities with primary responsibility for management of marine assets seeking to increase the sustainability of productive and conservation activities in marine and coastal ecosystems, while reducing net GHG emissions.

Issuers should be guided toward sectoral Criteria based on the primary purpose of intended use of proceeds. For the Marine Renewables sector, the primary purpose will establishing and operating marine renewable energy generation facilities or associated supply chain activities.

Some marine related mitigation, adaptation, and resilience investments may be more usefully handled through other sectoral Criteria of the Climate Bonds Standard, such as:

- **Wind and Solar.** Offshore wind and solar energy installations and associated transmission lines are addressed in the Marine Renewable Energy Criteria. On-shore wind and solar energy facilities are addressed by the Wind and Solar Criteria, respectively. The latter cover on-shore facilities and allow for (i) development, construction and operation of wind and solar farms; (ii) operational production or manufacturing facilities wholly dedicated to wind or solar energy development; (iii) wholly dedicated transmission infrastructure for wind or solar farms. These Criteria are among the first developed under the Climate Bonds Standard and do not yet fully address ecological impacts, adaptation, and resilience. In the next revision of the Wind and Solar Criteria these considerations will be incorporated.
- **Low-Carbon Water Transport.** Criteria are soon to be developed for water based transport, i.e. shipping, both passenger and freight. This does not encompass port infrastructure but dedicated infrastructure to power zero-emission vehicles can be included in these criteria as eligible.
- **Water.** There may be instances where marine renewable energy facilities are combined with desalination facilities. In these cases each subset of assets would have to meet the relevant Criteria.
- **Hydropower.** The technologies used for marine renewable energy and hydropower may be very similar. However, due to siting considerations that are unique to marine environments and estuaries, the Marine Renewable Energy Criteria apply to projects or assets located in marine environments or estuaries and the Hydropower Criteria will apply to run-of-river hydropower, impoundment hydropower and pumped storage, will be eligible for Climate Bonds Certification under the Climate Bonds Hydropower Criteria.
- **Electrical Transmission and Distribution.** Criteria are soon to be developed for electrical transmission and distribution, i.e. grids, which will encompass infrastructure that links energy generation facilities with transmission and distribution operators and consumers. Certain aspects to this may be more relevant for issuers than simply dedicated infrastructure in these criteria.

Importantly, the Climate Bonds Standard generally excludes assets related to fossil fuels so upgrades, efficiency improvements, and impact reduction for offshore oil and gas is not likely to fit within any sectoral Criteria.

How should multi-sectoral bond issuances be handled?

Different types of mitigation, adaptation, and resilience activities can be combined within a bond issuance. For example, near-shore marine renewable energy facilities may be developed in conjunction with energy efficiency improvements in port or tourism facilities or construction of desalination plants to

meet freshwater shortfalls. Combination of diverse interventions are inherent to integrated coastal management approaches.

The Climate Bonds Standard provides sectoral eligibility Criteria and guidance that is intended to provide full coverage for assets and activities that deliver legitimate climate benefits. Bond issuers can employ multiple sectoral Criteria in pursuing certification and must comply with all relevant components of the selected Criteria, relevant to their specific portfolio of assets.

Resulting Criteria

Marine renewable energy projects that are multi-use may also have to prove compliance with other Sector Criteria to be eligible for Climate Bonds Certification. For example, if a project included both marine renewable energy and aquaculture on the same site it would be necessary for the issuer to prove compliance with both the Marine Renewable Energy Criteria and the Aquaculture Criteria.

Appendix 1 – Working groups

Working group members

Marine Technical Working Group Members

- Christine Negra, Versant Vision LLC, Lead Specialist
- Tanja Havemann, Clarmondial, Lead Specialist
- Michael Adams, CEO, Ocean Assets
- David Agnew, Science & Standards Director, Marine Stewardship Council (MSC)
- Roberta Anderson, Sustainable Agriculture Expert, GlobalGAP
- Andrew Buglass, Founder, Buglass Energy Advisory
- Max Carcas, Managing Director, Euro Marine Energy Centre (EMEC) / Caelulum Ltd
- Charles Colgan, Middlebury Institute of International Studies at Monterey
- Andrea Copping, Marine Sciences Laboratory, Pacific Northwest National Laboratory
- Klaas de Vos, Environmental Defense Fund
- Louise Heaps, Chief Advisor on Marine Policy, WWF International
- Lucy Holmes, International Sustainability Unit
- Bill Karp, Scientist Emeritus, US National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA)[71]
- Carmen Lacambra, Ecosystems-Based Adaptation Expert, Global Climate Adaptation Partnership / Grupo Laera
- Michael Phillips, Director, Aquaculture & Genetic Improvement, CGIAR-World Fish
- Nancy Saich, Senior Advisor on Climate Action & Environment, European Investment Bank (EIB)
- Nick Shufro, Assistant Administrator for Risk Management, Federal Insurance and Mitigation Administration, US Federal Emergency Management Agency (FEMA)
- Brian Soden, Vice President, Science & Technology, Coastal Risk Consulting, LLC
- Ryan Whisnant, Head of Professional Services, Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)
- Stuart Whitten, Economics & Future Pathways, CSIRO

Marine Renewable Energy Industry Working Group Members

- Yannis Calogeras, Bureau Veritas
- Simon Currie, Norton Rose Fulbright
- Richard Hill, Norton Rose Fulbright
- Simon Dent, Althelia Ecosphere
- Joop Hessels, ABN AMRO
- Paul Holthus, World Ocean Council
- Raquel Hughes, Tidal Lagoon Power
- Fabian Huwyler, Credit Suisse
- Derek Ip, Trucost (part of S&P Dow Jones Indices)
- David Kemp, M & G
- Richard Sherry, M & G
- James Donegan, Ocean Renewable Power Company
- Lars Mac Key, Danske Bank
- Alexander McPhail, World Bank

[71] The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the authors and do not necessarily reflect the views of NOAA or the Department of Commerce

- Chris Milne, Scotrenewables Tidal Power Ltd
- Peter Raftery, BlackRock
- Monica Reid, Kestrel Inc
- Mark Robinson, DNV.GL
- John Shideler, NSF
- James Sinfield, Carbon Trust

Appendix 2 – Definitions

Climate Bonds Initiative (CBI): An investor-focused not-for-profit organisation, promoting large-scale investments that will deliver a global low carbon and climate resilient economy. The Initiative seeks to develop mechanisms to better align the interests of investors, industry and government so as to catalyse investments at a speed and scale sufficient to avoid dangerous climate change.

Climate Bond: A climate bond is a bond used to finance – or re-finance - projects needed to address climate change. They range from wind farms and solar and hydropower plants, to rail transport and building sea walls in cities threatened by rising sea levels. Only a small portion of these bonds have been labelled as green or climate bonds by their issuers.

Certified Climate Bond: A Climate Bond that is certified by the Climate Bonds Standard Board as meeting the requirements of the Climate Bonds Standard, as attested through independent verification.

Climate Bonds Standard (CBS): A screening tool for investors and governments that allows them to identify green bonds where they can be confident that the funds are being used to deliver climate change solutions. This may be through climate mitigation impact and/ or climate adaptation or resilience. The CBS is made up of two parts: the parent standard (Climate Bonds Standard v2.0) and a suite of sector specific eligibility requirements. The parent standard covers the certification process and pre- and post-issuance requirements for all certified bonds, regardless of the nature of the capital projects. The Sector Criteria detail specific requirements for assets identified as falling under that specific sector. The latest version of the CBS is published on the Climate Bonds Initiative website

Climate Bonds Standard Board (CBSB): A board of independent members that collectively represents $34 trillion of assets under management. The CBSB is responsible for approving i) Revisions to the Climate Bond Standard, including the adoption of additional sector Criteria, ii) Approved verifiers, and iii) Applications for Certification of a bond under the Climate Bonds Standard. The CBSB is constituted, appointed and supported in line with the governance arrangements and processes as published on the Climate Bonds Initiative website.

Climate Bond Certification: allows the issuer to use the Climate Bond Certification Mark in relation to that bond. Climate Bond Certification is provided once the independent Climate Bonds Standard Board is satisfied the bond conforms with the Climate Bonds Standard.

Green Bond: A Green Bond is where proceeds are allocated to environmental projects. The term generally refers to bonds that have been marketed as "Green". In theory, Green Bonds proceeds could be used for a wide variety of environmental projects, but in practice they have mostly been the same as Climate Bonds, with proceeds going to climate change projects.

Marine renewable energy assets and projects: Assets and projects relating to the acquisition and / or management of marine renewable energy facilities, and or the production of associated infrastructure. These facilities might include: marine wind, tidal and wave, and other technologies such based on ocean salinity and thermals.

Technical Working Group (TWG): A group of key experts from academia, international agencies, industry and NGOs convened by the Climate Bonds Initiative. The TWG develops Sector-Specific Criteria - detailed technical criteria for the eligibility of projects and assets as well as guidance on the tracking of eligibility status during the term of the bond. Their draft recommendations are refined through engagement with finance industry experts in convened Industry Working Groups and through public consultation. Final approval of Sector Criteria is given by the CBSB.

Appendix 3 – Debt capital markets and green investments

Capital markets have an important role to play in mobilizing equity and debt funding for green growth.

Capital markets enable issuers to tap into large pools of private capital from institutional investors. Bonds are appropriate investment vehicles for these investors as they are low-risk investments with long-term maturities, making them a good fit with institutional investors' liabilities (e.g. pensions to be paid out in several decades).

Bond financing works well for low-carbon and climate-resilient infrastructure projects post-construction, as capital markets also facilitate risk management. Across investors and financial markets, different entities face different types and severities of risks related to climate change, depending on many factors including degree of long-term exposure, likelihood of negative climate impacts, and ability to mitigate impacts or shift positions. There are three broad channels through which climate change can present risks to financial stability[72]:

1. Physical risks: the impacts today on insurance liability and the value of financial assets that arise from climate- and weather-related events, such as floods and storms that damage property or disrupt trade;
2. Liability risks; the impacts that could arise in the future if parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible. Such claims could come decades in the future, but have potential to hit carbon extractors and emitters – and, if they have liability cover, their insurers;
3. Transition risks: the financial risks that could result from the process of adjustment towards a lower-carbon economy. Changes in policy, technology and physical risks could prompt a reassessment of the value of a large range of assets as costs and opportunities become apparent

Risks to financial stability will be minimised if the transition begins early and follows a predictable path, thereby helping the market anticipate the transition to a 2 degree world.

Maintaining and enhancing production from all ecosystems will increasingly require investments to promote GHG mitigation and climate adaptation capacity and resilience. This should be of immediate interest to governments, which are developing and implementing the economic framework for natural resource management, and to far-sighted asset owners and managers concerned about long-term profitability and revenue predictability.

The green bond market can reward bond issuers and investors for sustainable investments that accelerate progress toward a low carbon and climate resilient economy. Commonly used as long-term debt instruments, green bonds are issued by governments, companies, municipalities, commercial and development banks to finance or re-finance assets or activities with environmental benefits. Green bonds are in high demand and can help issuers attract new types of investors.

Green bonds are regular bonds with one distinguishing feature: proceeds are earmarked for projects with environmental benefits, primarily climate change mitigation and adaptation. A green label is a discovery mechanism for investors. It enables the identification of climate-aligned investments with limited resources for due diligence. By doings so, a green bond label reduces friction in the markets and facilitate growth in climate aligned-investments.

[72] http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx

Benefits for investors include balancing financial returns with environmental benefits, satisfying environmental, social and governance (ESG) requirements or green investment mandates, enabling direct investment in the greening of brown sectors and enabling hedging against climate policy risks.

Benefits for issuers include providing an additional source of green financing, matching maturity with project life, improving investor diversification, attracting buy and hold investors, enhancing issuer's reputation and attracting strong investor demand leading to oversubscription.

Table 4. Stakeholders with direct interest in green investments span multiple sectors.

Stakeholder groups	Examples
Public sector: development banks, ministries (e.g. environment, finance), central banks, regulators (e.g. finance, health and safety), states / provinces, municipalities	• World Bank / Asian Development Bank / African Development Bank (green bonds explicitly referencing mitigation, adaptation, and resilience). • Climate-smart infrastructure (e.g. coastal protection investments) backed by government guarantee.
Finance sector: investors and asset owners (e.g. pension funds, sovereign wealth funds, private equity funds), credit agencies, banks, insurance/re-insurance	• European Investment Bank (EUR 650M Climate Awareness Bond). • Zurich Insurance (commitment to invest USD 2B green bonds). • Barclays MSCI Green Bond Index.
Corporate sector: companies, industry associations	• Marine renewable energy company: Investments in new / improved infrastructure. Returns from margin improvements, government incentives. Backed by corporate balance sheet / assets.
Market intermediaries: auditors, accountants, lawyers, stock exchanges	• S&P (climate rating). • Green Bond Principles.
Multilateral / civil sector: conservation NGOs; development agencies	• IFAD (Guidelines for Integrating Climate Change Adaptation into Fisheries and Aquaculture Projects).

How the Climate Bonds Standard & Certification Scheme can help grow the market

Development of eligibility Criteria under the Climate Bonds Standard is intended to broaden knowledge and capacity among potential bond issuers, investors and governments to promote major growth and development of climate bond portfolios and pipelines. The Criteria will facilitate the issuance of bonds from issuers who would otherwise find it difficult to gain recognition for their investments with beneficial climate-related impacts. 'First mover' Climate Bond issuers will especially need to minimize potential reputational risks associated with making commitments about environmental credentials; independent verification helps minimize these risks.

Additionally, creation of the Sector Criteria presupposes significant latent demand for bonds among institutional investors that want to invest in 'green' initiatives with predictable cash flows. We see evidence of this latent demand by the fact that green bonds and Climate Bonds are regularly oversubscribed; there is currently greater investor demand than green bond issuance. By providing a clear definition of assets and projects eligible for green investment, the Climate Bonds Standard Criteria can help investors to find desired investment opportunities as inaugural Climate Bonds Certified bond issuers step forward.

Lack of clear standards and definitions around green investments presents reputational risks for specific investments as well as green bonds more generally. Distinguishing between more and less green investments can be challenging and investors without a technical background may not understand how climate mitigation, adaptation, and resilience can be represented in a green-labeled bond issuance. Given these obstacles, the Climate Bonds Standard and its Sector Criteria seeks to expand the credibility of labeled climate bond issuances. Clear definitions and guidelines for bond issuers on the eligibility of investments under the Climate Bonds Standards and Certification Scheme provides assurance for investors about the climate benefits of fixed income investments.

The Climate Bonds Standard is relevant to the needs and responsibilities of different types of stakeholders. Institutional investors have a fiduciary duty to assess and compare investment risks, including those risk that originate from climate change. Institutions seeking financing need to be able to identify standards that are relevant to their finance needs and sector.[73] Technical decision makers need to be able to connect broad policy issues around climate mitigation to operational level decision-making. Policymakers and office holders have responsibilities related to public finance, regulation, and delivery of services.

Clear guidance from the Climate Bonds Standard should help to grow the green bond market by making eligible assets and projects clearly identifiable as 'low-carbon' and 'climate smart' and allow investors to easily incorporate them into investment strategies. It will also support the development of a securitization market through gradual investor education on asset performance and increasing familiarity.

Governments, companies, and financial institutions need tools to screen out (minimize) climate related risks and to proactively seek investments that mitigate climate risks. The Climate Bonds Standard and its Sector Criteria provides science-based guidance to both reduce carbon emissions as well as increase adaptive capacity and resilience of the assets and projects that underpin investments.

Table 5. Examples of potential bond types, issuers, and revenue streams of bonds that could be eligible for Climate Bonds Certification

Bond types	Issuers	Revenue streams	Purposes	Potential examples
Note: Some bonds may be a combination of two approaches e.g. asset-backed securities backed by government agencies or local authorities; or covered bonds with financial institution and portfolio bond characteristics.				
Public sector bonds	Government agency	Government budget via dedicated Special Purpose Vehicle (SPV) backed by government guarantee	Enhance national energy security and transition to clean energy generation	Community-based marine renewable energy projects.
Financial institution bonds	Bank	Pay back from borrowers, backed by bank	Increase financing to high-quality small-scale borrowers	Syndicated portfolio of loans to set of small-scale borrowers, especially with good historic performance (e.g. small scale marine renewable energy generation projects).
Portfolio bonds	Asset manager	Commercial activities	Leverage funding for a mix of investments	Portfolio of diverse yet related assets financed through a grouped bond issue (e.g. mix of new and existing marine investments).
Project bonds	Project owner e.g. asset manager	Revenues from new / improved productivity	Leverage funding for a specific project	Capex / opex for marine renewable projects.
Corporate bonds	Energy company	Returns from margin and productivity improvements (backed by corporate balance sheet / assets).	Increase / diversify investors; source new forms of supply chain investment	Investments in improved infrastructure and certification of supply chains.

[73] The concept of 'stress testing' for environmental risk has been introduced. See "Impact of Environmental Factors on Credit Risk of Commercial Banks" by the Industrial and Commercial Bank of China.

Appendix 4 - Pathway to certification

Climate Bonds Certification is available to bonds, or other debt instruments, funding assets or projects that meet the requirements of the Climate Bonds Standard. The actual Certification process is a five-step process shown in Figure 1.

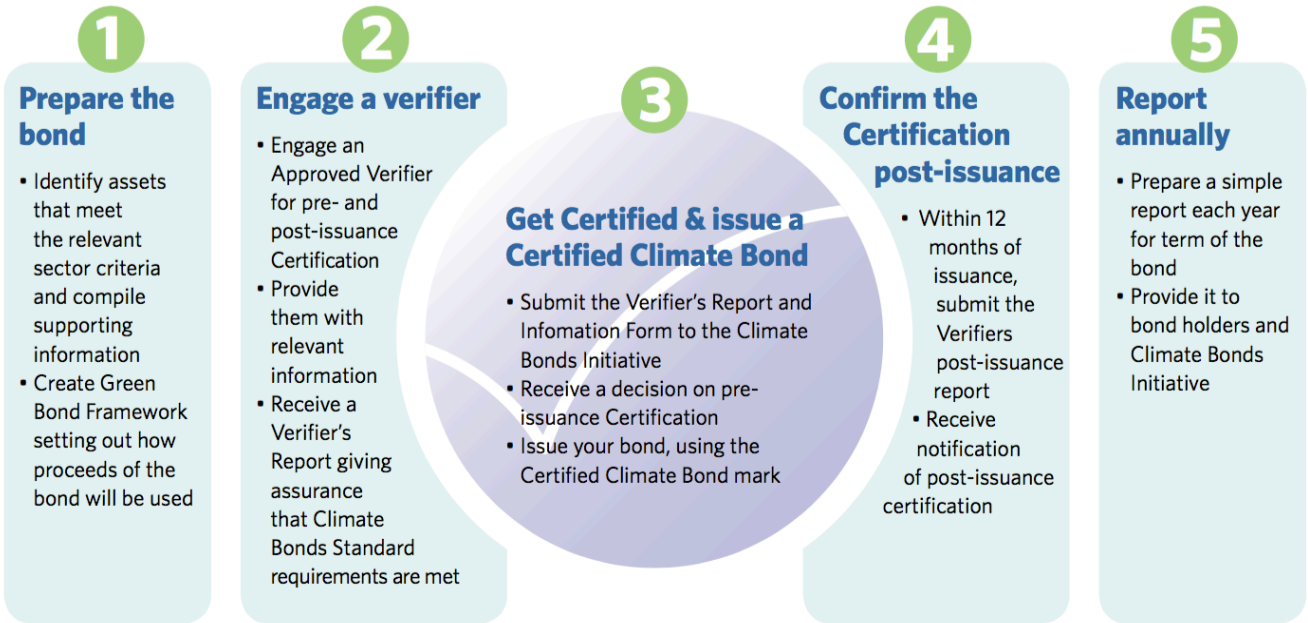
First, the issuer must prepare the bond by identifying the assets or projects that will make up the use of proceeds. For Climate Bonds Certification to be awarded, the use of proceeds must match assets and projects deemed eligible under the Climate Bonds Standard's Sector Criteria. Eligible assets are listed under the Climate Bonds Standard's Sector Criteria. One bond may contain eligible assets from a mixture of different Sector Criteria.

Next, a prospective issuer must appoint an approved third party verifier, who will provide a verification statement that the bond meets the Climate Bonds Standard. The Climate Bonds Standard allows Certification of a bond prior to its issuance, enabling the issuer to use the Climate Bonds Certification Mark in marketing efforts and investor roadshows. Subject to the recommendation of the third-party verifier and all the relevant reports being submitted, the prospective issuer is awarded Climate Bonds Certification.

Post bond issuance, the issuer and verifier have 12 months to submit a post-issuance report confirming proceeds have been allocated to eligible assets. Thereafter, the issuer must prepare a brief report annually to confirm that the bond is still in compliance with the Climate Bonds Standard.

Climate Bonds Certification is also available to bonds that have already been issued, this is referred to as post-issuance certification. The issuer just needs to appoint a third-party verifier to prepare a report stating that all use of proceeds fall within the Climate Bonds Standard's eligible projects and assets.

Figure 1: Climate Bonds Certification process for prospective issuers



Appendix 5 – Feedback from public consultation

Public consultation for the Marine Renewable Energy Criteria was held 14th June – 12th July 2017. Public consultation consisted of two webinars and promotion via the Climate Bonds blog and twitter. Technical Working Group and Industry Working Group members also promoted public consultation via their networks.

	Feedback	Response	Result	Source
1	One of the biggest early adoption challenges for wave and tidal technologies remains the technical risk i.e. the reliability and downtime risks	What is being described here is a credit risk to the asset as it would effect whether the asset makes the money it needs to.	No change	Email & follow-on call
2	Survivability of the asset in a hostile environment is a key concern with marine renewable energy assets	Yes, we've aimed to tackle this with the adaptation & resilience checklist including proof the issuer has considered whether the environment will become tougher due to climate change	Advised some specific changes to be made to the adaptation & resilience checklist (see 6-10 in this table)	Email & follow-on call
3	While best practice standards are not yet in place for marine renewable energy there is some development going on. Keep an eye on DNV.GL, Bureau Veritas, Lloyds Register & EMEC	Will follow these other initiatives and consider for further iterations if appropriate.	No change	Email & follow-on call
4	Is it worth identifying at what stage of a machine/arrays development the investment is targeted? There will be device developers aiming for investment in the first full scale prototype, but the first commercial arrays could easily be investable if there's been a successful prototype.	Discussed and concluded that these Criteria would not be achievable for first prototype projects but it is very unlikely they would issue debt to finance prototypes so that was not considered to be a problem. The Criteria are deemed achievable for any project other than prototypes.	No change	Email & follow-on call
5	On page 6, section 4.1, row 8 (from top to down), recommend adding the following two items: (1) Biomass energy (2) Hybrid Marine Renewable Energy, for example with fish farming or tourism also incorporated	(1) Biomass energy is tackled by our bioenergy Criteria so wouldn't be appropriate to add in here. (2) The topic of multi-use installations did come up in the TWG discussions. We do want to allow certification for assets like this but they would have to meet more than one set of Criteria. For example, if a project combined marine renewable energy and aquaculture, to achieve	(1) No change (2) Discuss this in the Background Document (i.e. that appropriate multi-use is encouraged but would have to meet requirements of all applicable Criteria). Mention in section 4.1 of the Criteria document:	Email

	Feedback	Response	Result	Source
		Climate Bonds Certification the project would have to meet the requirements of the both the Marine Renewable Energy Criteria and the Aquaculture Criteria (still under development). Until we have Criteria that can cover all areas of the hybrid project we'd not be able to certify.	Bonds financing multiple projects may also have to prove compliance with other Sector Criteria to be eligible for Climate Bonds Certification. For example, if a bond included both marine renewable energy and aquaculture on the same site it would be necessary for the issuer to prove compliance with both the Marine Renewable Energy Criteria and the Aquaculture Criteria. Or if a bond included onshore and offshore wind projects the issuer would need to prove compliance with both the Marine Renewable Energy Criteria and the Wind Criteria.	
6	As a check on the longevity of devices, section 3 should specify inspections at suitable intervals, evidence of inspection and that there is be a regular maintenance regime in place.	Add this in	Add in as 3.2 in Table 3: Inspections are carried out regularly and there is a maintenance regime in place for future inspections with evidence that this is adhered to.	Email & follow-on call
7	also in section 3, mention is made of training, capacity and governance to manage extreme events, but not specifically to suitable remotely-controlled or automated emergency shut-down procedures, which may be intended, but could usefully be spelt out	Add this in	In 3.1, table 3, edit text to read: The issuer has remotely controlled or automated shutdown procedures, training, capacity and governance arrangements in place to manage the impacts of exceptional events (such as extreme storms, winds etc.)	Email & follow-on call
8	under section 5 .1 should there also be discussion of any measures to prevent bio-fouling not presenting a risk to the eco-system otherwise?	Biofouling is the accumulation of microorganisms, plants, algae or animals on wetted surfaces. It can damage structures. Biofouling occurs everywhere but is most significant economically to shipping as it increases drag and, hence, fuel use.	Discussed with TWG and decided no change necessary. Biofouling is a climate issues for vessel and not so relevant to marine renewable arrays.	Email & follow-on call
9	5.1 mentions noise etc during installation, but I think should also mention during maintenance operations	Our use of installations was meant to mean renewable energy arrays rather than just the installation phase of a project. Will edit text to clarify	In 5.1, table 3, edit text to read: E.g. Noise and vibration generated by marine renewable energy arrays may disrupt animals, such as marine mammals, fish, birds, turtles, and	Email & follow-on call

	Feedback	Response	Result	Source
			invertebrates that rely on sound for navigation and other essential functions. The potential for collision-related injury or mortality of marine animals is a key parameter for impact assessment, particularly for tidal energy projects. Alteration of water circulation, sediment transport, and other physical flows by marine renewable energy devices as well as introduction of new electromagnetic fields (e.g. via suspended or seafloor cables) may negatively impact habitat quality. This might be especially relevant for tidal barrage but should be considered for all marine renewable arrays.	
10	I think section 5 should also address the potential for accidental site contamination – either from leakage of hydraulic fluids etc. or from wreckage / debris on the sea bed. The risks should be minimised in design and plans should be in place for a clean-up / tidy up should the event occur	This suggestion would probably fit well under either 5.1 or 5.2. Seems like a reasonable suggestion to stipulate something about this being factored in during design but also having a stated plan for if accidental site contamination happens and recognising where the possible risks / which chemicals will be present that could pose risks	Added below text in at 5.3 (which has shifted 5.3 to become 5.4 and 5.4 to become 5.5) The issuer has recognised and listed the potential risks for accidental site contamination either from leakage of hydraulic fluid (or any other potential pollutant) or from wreckage/debris on the sea bed. Demonstrable steps have been taken to minimise these risks and plans have been made for clean-up should a site contamination event occur.	Email & follow-on call
11	Many tidal in-stream device designs are also applicable to river environments. Are river locations considered in the marine renewable energy Criteria?	Deferred this question to the TWG and response was that as long as there isn't a dam involved in the river renewable energy, these Criteria could apply to those renewable energies too. However, we need to make sure that we are not overlapping with the Hydropower Criteria here.	Added to 4.1: These Criteria apply to projects or assets located in marine environments or estuaries.* *For the avoidance of doubt, run-of-river hydropower, impoundment hydropower and pumped storage, will be eligible for Climate Bonds Certification under the Climate Bonds Hydropower Criteria.	Public consultation webinar

	Feedback	Response	Result	Source
13	What happens if down the line some of the newer and unexplored fields have a bigger impact on biodiversity and ecosystems than originally thought when approved?	We commit to review the Criteria one year after launch or earlier if necessary. Whenever an issue is brought to our attention that would require alterations to be made to the Criteria we will review them based on the new findings.	No change	Public consultation webinar
14	How can ship owners get involved in this?	Shipping is going to be covered separately by Shipping Criteria. We plan to launch work on this by the end of 2017. Fishing vessels will be covered by the Fisheries Criteria that is already being developed.	No change	Public consultation webinar
15	In Table 3, section 1 & 2, issuer may claim that there are not any relevant risks. If this is the case, you'd want to be clear that you still expect evidence to prove this	Agree	Add this text in 1.1 and 2.1: If a project does not have any climate related risks or vulnerabilities (1.1) / impacts beyond the asset/site (2.1) evidence must be given to show how this was determined	Public consultation webinar