

Mapping Progress Towards Sustainable Ocean Finance: An Update on Blue Economy Developments, Investors and Finance Trends April 2020

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I: Introduction and Blue Economy Developments

Oceans, their marine ecosystem treasures, climates, ecosystems and economies may prove to be among our salvation or our potential downfall! Humanity appears to be facing increasingly unprecedented uncertainty

to our existence and business or lives as usual. Whether surging climate related natural disasters and climate change increasing in projected frequency, intensity and duration; the risks of global overpopulation; marine and land pollution, warfare over scarce resources; mass migration movements, pandemics such as COVID-19 with over 2000,000 cases, digital disruption and automation following the ascent of the Fourth Industrial Revolution, biodiversity loss, the plague of locusts affecting East African food security; many of these are dependent upon ocean related supply chains, coastal assets, located stakeholders and ecological processes. Stakeholders contribute over 90% of international trade. Equally, however, oceans, other water sources, rivers, coasts and related marine areas may yield significant opportunities -provided we know how best to responsibly manage our ecological heritage sustainably and far more cautiously than our legacy on land. Increasing global attention is focusing on the oceans, marine or blue economy as a recurrent theme; together with the green or climateproofed economy as the next frontier of opportunity to prioritise, and risk to be cautious of. The United Nations (UN) recognise that ocean assets are valued at over \$24 trillion. More government stakeholders, organisations and individual stakeholders wish to benefit from the projected growth from US \$1.5 trillion in economic activity and 31,000,000 direct jobs to over \$3 trillion and 45,000,000 jobs between 2010-2030.

The Blue Economy extends to many ocean and emerging blue economy activities as identified in Table 1.2. Each presents significant opportunities for sustainable ocean finance provided that sufficient attention is paid to the need to preserve long term ecological and economic functions as much as possible as highlighted in Table 1.3. Although many emerging opportunities, risks and developments have manifested with the surge of interest in the blue economy from marine biotechnology and pollution reduction/the circular economy to cruise and ecotourism to education and training, to drones and ocean governance and others; this has yet to be matched by a correlating increase in related finance; despite myriad expressions of interest and pledges. As subsequent analysis will investigate; this research's conceptual contribution is to provide an independent and experienced professional blue/maritime and climate change economist's perspective on the extent to which blue economy finance is available to stakeholders dreaming of achieving this future. Although conscious of the fact that this trend has only surfaced in the past 2-3 years or even more recent for both; it aims to map current progress towards sustainable ocean finance globally for selective, more transparent investors present. It recognises the need to provide an update on blue economy developments, investor s and finance trends/policy developments as of April 2020. This subsequently will aid stakeholders with scarce time, financial, information, attention, labour or other resources aiming to locate and prioritise sustainable

ocean or blue/marine economy and conservation finance, whether as individuals or companies with an idea, project or product; governments, academics and other policy stakeholders seeking to advance the blue economy and myriad developments; NGO's seeking support or investors seeking a viable rate of return on investment and curious as to their possible competitors.

Table 1.2: Ocean and Blue Economy Activities

| Ocean Economy Activities | Emerging Blue Economy Opportunities |
|---------------------------------------|------------------------------------------------------------|
| Fisheries, Aquaculture | Cabotage |
| Shipping; Transport and Ports | Marine finance, entrepreneurship and insurance; Dry Ports |
| Marine and Cargo Services | Undersea mining/Bioprospecting |
| Navies - Ocean and Coastal Governance | Drones, Robotics/Marine Protection |
| Offshore oil and gas | Marine Renewable Energy; Desalination |
| Marine, Cruise Tourism and Recreation | Marine Biotechnology; Blue Carbon |
| Education and Training | Maritime research and development, Technology e.g. sensors |
| Ship Repair | Vessel automation and conversion |
| Small Harbours and Marinas | Marine pollution, waste recycling and the circular economy |

Source: This Study

Table 1.3: Ecological/Economic Functions of Oceans and Blue Economies

| Ecological | Economic |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Biomass/Biodiversity Life Formation and Habitat | Life, Food, Material |
| Conservation | Supply of Natural Resources, Reduced Imports |
| Biological/Physical/Chemical | Redundancy against Uncertainty |
| Growth, Reproduction, | Trade, Production, Consumption, Income/Profit |
| Respiration/Oxygen/Photosynthesis | Greenhouse gas mitigation funding/source sink |
| Water supply/purification. Food security/Nutrition | |
| Protection | Protection – Vulnerability and Resilience |
| Ocean Chemistry, currents, salinity | Risk Identification, Monitoring, Prioritisation, Adaptation |
| Coral atolls – geographical physical formation, continued growth and survival | Risk Enhancement if Ignored – Legal, Reputational, Insurance, Security, Operational, Impact Costs |
| Sand formation, nourishment and sediment | Opportunity |
| Evaporation, Condensation and Absorption | Insurance against Maladaptation, |
| Climate Regulation –calcification, stratification | Future Sustainability and Survival |
| Counter eutrophication | Knowledge – Existing and Potential/Spiritual |
| Detoxification | Stability/Security/ Increased Adaptive Capacity |
| Population equilibrium | Aesthetic/Cultural/Social |
| Tourism | |

Source: This Study.

Globally and across many nations, organisations and investors; the blue economy is receiving increasing attention in policy frameworks, as people strive to radically transform the oceans. Recent blue economy approaches and developments range from the European Union's Horizon 2020 and FAO Blue Growth Vision to the Atlantic Strategy; INTERREG, African Union Integrated Maritime Strategy, Asian Development Bank's Blue Oceans Action Plan, World Bank's PROBLUE, the Commonwealth Blue Charter Commonwealth Marine Economies Programme across 17 nations of the South Pacific and Caribbean, the 2020 Pacific Ocean Pathway and individual nation examples such as the Seychelles Blue Economy Roadmap and South Africa's Operation Phakisa. Mauritius has a Blue Economy Roadmap, Ministry, National Development Plan and Stakeholder National Ocean Council. The private sector is mobilising via initiatives such as the Blue Prosperity Coalition; the World Ocean Council and myriad events from Blue Economy Caribbean to Blue Economy events in Kenya and Tunisia or the 2019 Sustainable Ocean Summit in Paris. South Africa has responded with Operation Phakisa, producing over 6,400 jobs and R24 billion of investments. It aims for the blue economy to double from 11 to 25%+ by 2025 with a seafood hub, aquaculture, technology, fisheries and cruise tourism. Operation Phakisa aims to generate 1,000,000 maritime related jobs by 2030 from 256,000 in 2010, adding R177 billion to GDP. Four target areas of offshore oil and gas with 30 new oil wells; marine transport and ports; industrial aquaculture; maritime manufacturing with ship repair; tourism and 22 new marine protection services/marine protected areas (MPA's) in 10 years. Opportunities and investments cited under the African Integrated Maritime Strategy and Operation Phakisa including ship repair, maritime education, aquaculture, marine tourism, oil and offshore gas. It claims to maintain and refurbish existing ship repair facilities at all ports. It seeks R2 billion co-funding, targeting 20,000 jobs by 2023 and R6.5 billion projected GDP contribution.

Increasingly various blue economy projects are being undertaken or attempted including the Indian Ocean Rim Association tender to study blue economy and coastal cities in East Africa. The World Bank cancelled a tender for North Africa's blue economy, investigated Vietnam, India and Guinea along with Pro-Azul for Mozambique and are advertising options for the Caribbean in 2020. The International Labour Organisation and African Development Bank are considering it for Madagascar. South Africa created the Durban Blue Oceans Economic Framework, the first southern hemisphere city level strategy. It also placed a tender for the Northern Cape region, whilst the Benguela Current Commission are similarly conceptualising the ocean

economy. The private sector, investors and associated governments are considering other opportunities. For example, the Seychelles is among the global pioneers in blue economy strategies with its own Blue Economy Ministry, Road Map and University Research Institute. It targeted blue carbon bonds, \$21,000,000 debt-for-nature swap and 30% of marine areas to be protected. Kenya hosted a popular Blue Economy Conference in November 2018, revised its Fisheries Ministry to incorporate the blue economy and form a Blue Economy Implementation Committee. The Mediterranean are contemplating a Blue Economy Investment Platform.

It is therefore increasingly important to prioritise and investigate the opportunities envisioned or presented globally by the blue economy. In the Caribbean alone it was estimated as being worth over \$407.6 billion total value in 2018, with tourism contributing \$56.4 billion, influencing over 43,000,000 consumers among 19 countries and covering 2,750,000 km² of EEZ and ocean. Investments are projected to multiply far beyond the capacity of existing investors from areas such as the Grenada Blue Network –for Innovation; Barbados Ministry of Ocean Economy; Branson Carbon War Room and Centre of Entrepreneurship; Caribbean Challenge Initiative; UNDP Blue Accelerator Lab and Grenada Coastal Blue Growth Master Plan. Others include the, New Jamaica/Caribbean Fisheries Framework and Clean Ocean Alliance The 2013 Caribbean Climate Initiative formally recognised the need to accelerate marine environment conservation as 20% by 2020 and was immediately ratified by 9 nations. Significant biodiversity exists from over 12,000 fish and 13,000 unique plant species. The Eastern Caribbean Regional Oceans Policy and Action Plan presents a coordinated response to marine spatial planning and use. Sustainable finance and blue economy entrepreneur incubation hubs are pursued by the UNDP Accelerator Lab/Ministry of Blue Economy in Barbados and the Branson Centre of Entrepreneurship in Jamaica.

Richard Branson has also favoured a Carbon War Room to convert Caribbean economies away from fossil fuels. Grenada is forming a Blue Growth Masterplan preserving 25% of its marine environment areas by 2020 plus a Blue Growth and Oceans Governance Institute. A Blue Network to capitalise on innovation and networking collaboration is being formed. Barbuda are forming a community blue economy and integrated coastal zone management strategy via the Blue Halo Initiative. The Caribbean Large Marine Ecosystem Project and the Caribbean Regional Oceanscape Project further strive to accomplish this through a formal knowledge hub and evaluation of policies to coordinate effective blue economy growth. A Caribbean Catastrophe Risk Insurance Facility and Oceans and Aquaculture Sustainability Facility have also been prepared. Finance options include climate funds, impact and blue bonds, debt swaps, aid, crowdsourcing,

diaspora funding and remittances; insurance, blended financing, taxes and tourism/conservation levies and sovereign wealth funds. These need to be accompanied by ring-fenced safeguarding measures to ensure transparency and accountability so funds are channelled off directly into blue economy related policies.

The South Pacific are targeting the blue economy with its own Blue Economy Conference and Ocean Pathway initiative in 2017 among stakeholders towards attaining UN Sustainable Development Goal 14. Its policies specifically concentrate on ensuring protection of marine and coastal ecosystems (160 voluntary commitments); countering climate change, marine pollution (540 voluntary commitments) and ocean acidification and cultivating fisheries/other blue growth initiatives. It emphasises cultivating research capacity and implementing international maritime law. It also expressed concern that only 5% of ocean territory had been adequately chartered and few existing stakeholders and networks were meaningfully engaged to sufficiently understand the context, risks and potential prospects of a Pacific blue economy. Melanesia alone is estimated as containing over \$5.4 billion of blue economy assets each year. The initial 2016 Maritime India Summit attracted over \$13 billion in port and logistics related investments. It directly concentrates on marine fishing (\$5.05 billion in 2016), biotechnology, mining, tourism and leisure, construction, renewable energy, ICT, commerce, education and research, manufacturing, shipping, ports and logistics. In 2014 Bangladesh also sought this via its “Bay of Bengal Partnership for the Blue Economy for nearly 30 million affected value chain participants.” China’s Five Year National Plan for the Marine Economy includes smart ports, territorial claims and artificial islands, the great Undersea Wall, seabed mining, underwater research stations and residences, submarines, ship repair yards and icebreakers.

Our future Blue Economy Age increasingly needs into capitalise on emerging innovations, entrepreneurship, finance and ideas to harness the ingenuity of humanity to resolve the perils and catastrophes that we face. Global climate change is projected to threaten myriad ports and blue economy activities, creating up to \$157 billion for the Cook Islands alone -one small archipelago nation, if not radically acted upon. No previous source has accurately forecast the extent to which marine pollution, plastic waste or any other type exists; the impact cost damages it produces or how it specifically threatens the future prospects of the blue economy. Over 9.2 billion tons of plastic were reported by the United Nations Environmental Programme as being produced between 1950-2017, up to over 380,000,000 tons per year and 44% is produced by Asia. Over 500 billion single use, plastic bottles alone form part of this waste of resources, when glass substitutes exist. The UK Royal Statistical Society in 2019 estimated 90.5% of all waste has never been recycled, 12% was incinerated and 79% became litter or landfills. UNEP estimated an average of 2.3 kg of litter per person per

day on average for small island developing states. The global plastic industry may have pledged significant efforts in education, research, outreach programme. But this is camouflage masking the apparently over 40% increase in global plastics production via 300 expanded or new facilities scheduled from 2020-2025 at a cost of over \$200 billion. Plastic will contribute over 56 gigatons of carbon dioxide emissions, rapidly accentuating climate change.

From 1986-2010, Ocean Conservancy's International Coastal Clean Up only managed to remove an impressive 152,077,087 pieces of marine litter. Cigarettes and filters included 52,907,956, food wrappers and containers contributed 14,766,533, caps and lids 13,686,423, plastic bottles 9,549,156 and glass bottles 7,062,199. An alternative source estimated over 268,000 tons are floating in the oceans, with over 5.25 trillion pieces of plastic based on 24 expeditions from 2007-2013. Of the total of 5.25 trillion pieces (1,990 billion is traced to the North Pacific, 1,300 billion to the Indian Ocean, 930 billion for the North Atlantic, 491 billion for the South Pacific, 297 billion for the South Atlantic and 247 billion for the Mediterranean. Nets were used to collect samples for analysis. Estimates ranged from 1000 to 890,000 pieces per square kilometre of surveyed ocean. These present as yet unquantified economic, ecosystem and public health risks from asthma to obesity, HDHD, thyroid disorders, cancers, choking, poisoning, infertility and other issues. Synthetic polyester textile fibres also contribute to marine waste. Further projected waste is expected to emerge as a result of the COVID 19 pandemic from rubber gloves, masks and other disposable items, even more in the short term than single use plastic and rubber items.

The top 5 garbage accumulation sources -The Eastern, Western, Northern, Southern and Indian Ocean Great Garbage Patches. The Great Pacific Garbage Patch was estimated by 2018 to have expanded to over 1.5 trillion pieces occupying over 8,095,000 km² -equivalent to most of Europe. The South Pacific Garbage Patch in a 2011 survey identified an average of 26,898 pieces of plastic per square kilometre (Eriksen et al. 2013). As previously stated over 800 marine species have suffered from plastic ranging from crustaceans seeking refuge in the Mariana Trench to the most polluted and one of the remotest islands -Henderson Island to 87% of monitored birds in Canada's Arctic. The more remote the location; the higher the risk of accumulated waste being far more gruelling and laborious to actually remove or act upon. According to UNEP in 2019 China ranked highest in ocean plastic pollution not recycled (28% of observed global levels), Indonesia (10%), Philippines and Vietnam (6%), Thailand (3.2%), Egypt (3%), Nigeria (2.7%) and South Africa (2%).

Other solutions needed for sustainable ocean finance to be mobilised include those of law enforcement and global ocean governance including possibilities of drones; increasing digitisation, technology and the 4th Industrial Revolutions. Marine biotechnology, aquaculture and eco-protection can radically transform food security, human health and waste reduction. Reviving fishing harbours, small marinas and eco-tourism can preserve communities, heritage and ecosystems. Marine renewable power and biofuels can provide alternatives to empower and transport our characters. The circular, green and blue economies can resolve issues of pollution and waste via greater sustainability. The European Commission support the transition towards the circular economy through both economic market and more direct regulation/education approach incentives along with research, funding; waste infrastructure, aid and outreach endeavours. It envisions potential to generate 580,000 jobs, save 600 billion in costs for European businesses and by 2030 simultaneously curb carbon emissions by over 450,000,000 tonnes from greater recycling and reduced production/incineration. It estimated marine litter costs also costs at least 16 billion. Therefore, innovations and financial support mobilised for the blue economy can manage rapid human overpopulation; preserve biodiversity loss and species; enable greater safety, security and climateproofed supply chains against climate change. It can radically reduce poverty and support myriad community livelihoods, whilst still remaining viable and profitable from reconfigured education, economies, communities and environments. More blue carbon, ecological sanctuaries and other investments can prove to be profitable, sustainable financed and a pathway out of debt -such as in a debt for nature swap.

For example, the global blue bioeconomy currently exceeds US \$ 176 billion and food security to over 3 billion people. Internationally a number of IORA, Commonwealth, US, Japan and other nations are investigating marine biotechnology potential prospects. The European Union is seeking to rectify this research deficit through a number of core initiatives under Horizon 2020 and other emerging opportunities. Existing sources and policies indicating this emergent research opportunity including the recently formulated include the Marine Biotechnology Strategic Innovation and Research Road Map under the EU Marine Biotech programme (European Commission's 7th Framework 2013-2017). Objectives, which this research proposal will directly and indirectly support include exploration of the marine environment; biomass production and processing; product innovation and differentiation; enabling technology and infrastructure along with policy support and blue economy development/beneficiation. It is further supported in Rodriguez's 2013 mention of the economic potential of marine biotechnology in contributing to the European Commission's Blue Growth Strategy and Integrated Maritime Strategy. In Germany, particular attention in 2019 is being formulated as

part of a Baltic Blue Biotechnology Alliance and Marine Research Consortium partnering with other European stakeholders. The Seychelles have introduced it to their Blue Economy Road Map Strategy whilst Mauritius recently proposed a tender to investigate the feasibility of establishing a specialised Africa research facility. Recent research in marine biology, further enables the long-term sustainable viability and commercial interest of biotechnology for private companies. There has been a surge of blue biotechnology clusters, finance and specialised networks from European, US, Mexico, Australia and Chinese nations, especially the UK, Germany, Switzerland and Scandinavia.

II: Blue Economy Investor Sources, Finance Types and Principles

However, very few specialised research sources have been publicly disseminated or privately financed to consider how much progress has been made in the various financing sources, criteria and contributions made by various stakeholders so far or what else remains necessary to capitalise further on blue biotechnology, marine pollution reduction and other blue economy activities. Improved awareness of the value to be obtained in prioritising blue natural capital, carbon, biomes and environments; can yield hope and inspiration to others to reciprocate in activating to conserve the oceans; whether as activists; youth; funders; volunteers, those employed or otherwise motivated. As a blue economy specialist, one focuses on not only overcoming existing barriers of information uncertainty, asymmetrical information; creating a network of stakeholders and deciphering the psychological reluctance of people to invest but focusing on overcoming the great gap between pledged or potential blue economy/sustainable ocean finance versus the reality.

Global maritime finance and ocean finance is traditionally structured towards tax revenues, government grants, infrastructure bonds, conventional maritime insurers and commercial banks for shipping and cargo, along with the user pays principle for commercial ports and maritime services. This paper proposes future research focus on new sustainable ocean financing solutions to ensure successful blue economy projects from the above blue economy developments. Funding comes from a variety of sources including the Seychelles and Norwegian blue economy bonds; conservation finance and donation by NGO' supporters and philanthropists to individual entrepreneurs and technical start-ups such as the Portugal Blue Lab Accelerator Network, UNDP Blue Labs and others across the USA and Mediterranean. Additional opportunities exist to create new blue economy banks and risk management models incorporating climate change. They include maritime stock exchanges with blue carbon and ocean economy bonds, shares, venture capital and crowd

sourcing. Existing insurance firms, sovereign wealth and pension funds plus individuals could invest further in maritime ecological capital and other products/services specifically recognising and assimilating to climate mitigation/adaptation.

In a 2017 European Commission study to support investment in the blue economy, it motivated the need for a potential Blue Economy Fund and Investor Platform, indicating 112 certain stakeholders who served as potential investor sources (Table 2.1) (European Commission 2017). It estimated the blue economy directly contributes 5% to European GDP. Of 115 initial investment companies, 72 were selected for the proposed Blue Economy Investment Platform, ending up with 67. Sources include crowdsourcing, public and private banks, investment fund managers, investment platforms, accelerators, EU financial institutions and various other types. It is an increasingly recent trend as 65% were formed in the past 5 years (since Horizon 2020) and 35% in the past 3 years. European ports have access to at least 2.2 billion euros, blue biotechnology 3.7 billion and 2.6 billion euros for marine renewable energy. Coastal protection is significantly lower with only around 222 million euros. Unknown but limited finance exists for marine and coastal tourism, aquaculture and other activities including the marine/circular economy. The source argues myriad investment gaps exist including the need for 30 billion euros to decommission old North sea oil and gas platforms, 48 billion for seaports (excluding climateproofing of 100-250 billion euros), 22.5-30.8 billion for marine renewable energy and unknown for tourism, aquaculture, small harbours, desalination and other activities including maritime education, training, research, entrepreneurship and ocean governance. Although not specifically targeting the blue economy or oceans, the European Union High Level Expert Group on Sustainable Finance focused on the need for increased awareness, incentives and guidelines to provide more certainty towards this nascent sector (EU High Level Expert Group on Sustainable Finance 2018). These would consider social, environmental and other responsibilities initially with green bonds, preserving natural capital, agriculture and ocean purposes as much as they were capable of. It extended towards a retail strategy and criteria to form sustainable finance, to incentivise others to purchase, invest and support this initiative.

Table 2.1: Investor Sources Who Have Expressed Potential Interest In the Blue Economy

| Possible Blue Economy Investor Source | Level of Interest | Year |
|---------------------------------------|-------------------|------|
| 500 Start Ups | Medium | 2010 |
| 8F Asset Partners | High | 2016 |
| Ace Management France | High | 1995 |
| Alimentos Ventures | High | 2015 |
| Aloe Private Equity | High | 2003 |
| Althelia Ecosphere (part of Mirova) | High | 2011 |

| | | |
|---------------------------------------------------|--------|------|
| AMA Capital Partners | Medium | 1997 |
| Aqua-Spark | High | 2013 |
| A-Spark | Low | 2005 |
| Baille Gifford and Company | Low | 1904 |
| BCK | Low | 1924 |
| BCK Mid-Cap Investment Platform | Low | 1924 |
| Blue Economy Fund | High | 2017 |
| Blue Ocean Capital | Medium | 2005 |
| Bonafide | High | 2009 |
| BPI France | Medium | 2012 |
| British Business Bank | Low | 2014 |
| Brookfield Investment Management Low | | 1960 |
| CAP TRI IN NORD_PAS DE CALAIS -Low | | |
| Catch Invest High | | 2017 |
| Calaxe des Depots Low | | 1818 |
| CDP Climate Change Risk Sharing Investment Medium | | 2016 |
| CDP IP-Mid-Cap Low | | |
| Circularity Capital Medium | | 2018 |
| CIT Group Low | | 2002 |
| Clarmondial AO Low | | 2018 |
| Clearwater Marine Investments Medium | | 2002 |
| Connecting Europe Facility Low | | |
| Continental Advisory Services Low | | 2002 |
| Coperton Equity Fund | Medium | 2016 |
| Copenhagen Infrastructure Partners | Low | 2012 |
| COSAVE | Low | 2014 |
| Cowan | Medium | 1918 |
| CRX Marine | Low | 2012 |
| Devonian Capital | High | 2015 |
| Diorama Hellenic Growth Fund | Medium | 2017 |
| Ekosea | High | 2017 |
| Elbe Financial Solutions | High | |
| Elite Basket Bond 1 | Medium | 2018 |
| Encourage Capital | High | 2014 |
| Ermat Runen | High | 1985 |
| Eurofin Group | High | 1964 |
| European Agricultural Fund for Rural | Low | |
| European Business Network | Low | |
| European Maritime and Fisheries Fund, | High | 2014 |
| European Social Fund | Low | |
| European Regional Development Fund | Medium | 1975 |
| FOND-ICO-Global | Low | |
| Fortitude Capital | Low | |
| Fonde SPI | Low | |
| Fomy-bar AS) | Medium | |
| French Overseas Territories Infrastructure RUP | Low | |
| Global Investment Maritime Fund | Medium | 2010 |
| Green Climate Fund | Low | 2010 |
| Green Investment Group Macquarie | Low | 2012 |
| Green Metropole Fund | High | 2017 |
| Green Shipping Loan Programme | High | 2015 |
| Green Shipping Guarantees Programme | High | 2016 |
| Greenbackers Investment Capital | Low | |

| | | |
|------------------------------------------------|--------|------|
| Green Bridge | Low | 2012 |
| Growth Equity Funds Mid-Caps | Medium | 1995 |
| Haf Limburge Energy Funds | Medium | 2013 |
| Innofin Energy Demo Projects Pilot | Low | |
| Innofin Large Projects | Low | |
| Innofin Midi-Cap Growth Finance | Low | |
| Innofin Midi-Cap Quarantine | High | 2014 |
| Innofin SME Quarantine | High | 2014 |
| Innofin SME Venture Capital | High | 2014 |
| International Finance Corporation | Low | 1955 |
| IPSA Maritime | High | 2012 |
| Italia Venture Fund | Medium | 2015 |
| ITATECH | Medium | 2015 |
| Katapult Ocean | High | 2015 |
| KW Bank | Low | 2005 |
| Knedlach | Low | 2012 |
| Marine Capital Ltd | Medium | 2003 |
| Maritime Asset Partners | Medium | 2017 |
| Maritime Equity Partners | Medium | 2009 |
| Maritime Investment Fund | Medium | 2010 |
| Maradar | Low | 2005 |
| Meloy Fund for Sustainable Community Fisheries | High | 2015 |
| Mermaid Investment | High | 2017 |
| MT BS | Low | 2017 |
| Mubadala Investment Company | Medium | 2017 |
| Multi-Country Investment Platform for SMEs | Low | 2015 |
| Nambas Atlanpole | Low | 2015 |
| Neptune | High | 2015 |
| NER 300 | High | 2013 |
| New Enterprise Associates | Medium | 1977 |
| Nordic Investment Bank | Medium | 1975 |
| Northam Shipping Fund | High | 2008 |
| Ocean Solutions Accelerator | High | 2015 |
| Oceano-Azul | High | 2015 |
| PW | Medium | 1995 |
| Port XL | High | 2015 |
| Pro-Venture | Medium | 2007 |
| Rotterdam Port Fund | High | 2015 |
| Scottish Enterprise | Low | 1991 |
| Scottish Equity Partners | Medium | 2000 |
| Scottish Investment Bank | Medium | 1991 |
| Scottish Investment Fund | Low | |
| Seabury Capital | Low | 1995 |
| Seedra | Low | 2009 |
| Sky Ocean Ventures | High | 2017 |
| Strategic Banking Corporation of Ireland | Medium | 2014 |
| Swedbank | Low | 2006 |
| Televentures | Low | 1993 |
| The Yield Lab | Medium | 2014 |
| Triodon Bank | High | 1980 |
| Scottish-European Growth Co-investment | Medium | 2017 |
| Baltic Innovation Fund | Medium | 2012 |
| Innoenergy | High | 2008 |
| ABN AMRO | High | 1991 |

| | | |
|----------|------|------|
| Rabobank | High | 1972 |
| ASN Bank | High | 1950 |

Source: European Commission 2017

However, this research, found insufficient information or credible evidence exists for the majority of these companies, whilst other sources of equity could be more verified. Very few have specific investment trends as yet. The source remains Euro-centric rather than focusing on global needs and prospects across various blue economy activities and marine ecosystems including blue carbon and protected areas or natural capital. It therefore aims to conduct a detailed blue economy investment trend identification and analysis in Section III, where in information is possible for those summarised in Table 2.2. Several sources are proposing recommendations or guidelines as to how blue economy finance should be structured but the only one to receive significant credibility and consensus is the 2017 UNEP Sustainable Blue Economy Finance Principles endorsed by the World Ocean Council and an increasing number of the more committed and proven investors. These 17 Principles for Sustainable Investment in the Blue Economy include the following:

- 1: Productive:** We will ensure that the projects we support restore, protect or maintain the diversity, productivity, resilience, core functions and value of marine ecosystems.
- 2: Compliant:** We will ensure the projects we support are compliant with international, regional and national and voluntary frameworks which underpin sustainable development and ocean health.
- 3: Risk aware:** We will ensure the activities we support have identified the social and environmental risks and impacts and have management plans.
- 4: Adoptive:** We will adapt our decision-making processes and activities to reflect new knowledge of the potential risks, impacts and opportunities associated with our investments.
- 5: Systemic:** We will ensure that the projects we support have identified the systemic and cumulative impacts of their activities including across their value chain, across different sectors, across borders and between land and maritime based activities.
- 6: Incisive:** We will ensure that the projects we support engage with, include, support and enhance local livelihoods and that they have a stakeholder engagement.
- 7: Holistic:** We will make investment decisions based on a long-term assessment and accounting of economic, social and environmental values, quantified risks and systemic impacts.
- 8: Cooperative:** We will cooperate with other financial institutions to promote and implement these Principles, best practises, lessons learnt, perspectives and ideas.
- 9: Transparent:** We will disclose our investments and their social, environmental and economic impacts (both positive and negative). We will also report on progress in implementing these Principles including on the percentage of our investments that follow these Principles.
- 10: Purposeful:** We will endeavour to direct investment that contribute directly to the achievement of Sustainable Development Goal 14 (Life Below Water) and other Sustainable Development Goals which contribute to the management of the oceans.
- 11: Impactful:** We will ensure that the projects we support provide social, environmental and economic benefits to current and future generations.

12: Precautionary: We will ensure that the projects we support have assessed the environmental and social impacts of their activities based on sound scientific evidence. Where scientific data is not available, the precautionary principle will prevail

13: Proactive: We will actively seek to develop knowledge and data on the potential risks and impacts associated with our investments as well as sustainable investments in the blue economy.

14: Diversified: Recognising the importance of small and medium enterprises in the Blue Economy we will endeavour to diversify our investment our investment instruments to reach a wide range of sustainable development projects.

15: Solution driven: We will endeavour to direct investments to innovative, commercial solutions to maritime issues (both land and ocean based -including circular economy approaches that have a positive impact on marine ecosystems and ocean dependent livelihoods

16. Partnering: We will partner with public, private and nongovernmental sector entities to accelerate progress towards a sustainable blue economy.

17: Sharing: We will endeavour to Invest in and share scientific information and data on the marine environment.

Table 2.2: Potential Blue Economy Investment Sources for Analysis

| | |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Ocean 5 | Alimentos Ventures, |
| Ocean 14 Capital | Blue Bio Value |
| Blue Natural Capital Financing Facility | Blue Economy Zone Industrial Fund |
| Althelia Funds | Aloe Private Equity/Energy |
| Mirova Sustainable Ocean Fund | Katapult Ocean |
| Blue Carbon Initiative | Bonafide Ltd. |
| Blue Solutions. Blue Area Fund | Fishing Accelerator |
| International Partnership on Blue Carbon (IPBC) | Greenbackers Investment Capital |
| The Meloy Fund | International Capital Market Association |
| Pro-Azul | Investas – Association luxembourgeoise des investisseurs privés |
| Ocean Exchange, | Mermaid Investments, |
| Ocean Hub Africa | Ocean Assets Institute, |
| SWIOFISH 1 Mozambique | Alpha Blue Oceans |
| Blue Oceans Partners, | Rockefeller Asset Management, |
| Alpha Blue Oceans | Invest in Vibrant Oceans |
| Caribbean Development Bank | Encourage Capital |
| Commonwealth Secretariat -Commonwealth Marine Economies Programme | Bloomberg Philanthropies |
| European Investment Bank | Sea-Ahead, |
| Horizon 2020 | SKY – Ocean Rescue Fund |
| World Bank Pro-Blue programme etc | Asian Development Bank Plan for Healthy Oceans and Sustainable Blue Economies |
| Blue Prosperity Coalition | Conservation Finance Alliance |

Source: This Study

Existing sources on sustainable ocean finance or the blue economy also allude to blue natural capital, carbon or an ecosystem based approach that incorporates traditional investment but also new social, environmental and marine based criteria in determining a rate of return, dividend or profit and risks. Examples include the Blue Natural Capital Financing Facility and its Positive Impacts Framework considering habitat and species

conservation with set performance indicators. Global ocean finance includes funds by donors devoted to conservation finance, climate change, illegal fisheries, ocean governance and other aid, grants or finance that can be devoted towards ocean, coastal or marine based risks, problems, innovations, technology, entrepreneurship, education, awareness, support, sustainable resource extraction, utilisation or processing; protection, conservation and restoration. Pacific Ocean governance finance was estimated by a 2018 study by Dr Walsh to expand from US \$100 million in 2013 to \$430 million by 2018 to \$775 million per year by 2040. Whilst funding and finance have rapidly increase, existing sources still reflect a mere fraction of what is increasingly necessary to really commit to the blue economy.

Many of these investments can be far more profitable for savers and investors when compared to increasingly lower global trends globally from 5.25% average interest rate in banks in South Africa to 2.95% in Fiji, the Cook Islands and the South Pacific to 0.25 in Australia to 0.1% in the United Kingdom, to 0.25% the Federal Reserve Bank in the USA and 0 across the European Union, -0.75 in Switzerland, -0.1 Japan and 4.5% in China as of 17th April 2020. The COVID 19 epidemic has created historically low rates of return. The Seychelles Blue Bond was initially oversubscribed with a 15 year lifespan offering a 6.5% return. It was structured for \$12 million for blue economy development activities and \$3 million for ecological conservation. In January 2019, the Nordic Investment Bank was also in offering a 0.375% return for a \$200 million blue economy bond. Blue bonds prioritise reducing vulnerability, enhancing resilience, ensuring sustainability and profitability whilst conserving livelihoods, heritage and ecosystems. One study on blue bonds by the Blue Natural Capital Financing Facility indicates the need for adequate monitoring and verification processes, impact management processes and investment ready, viable projects (Roth, Thiele and von Unger 2019). The quantity of blue carbon produced or emissions absorbed could provide a potential indicator along with the extent of progress towards implementing local or regional policies or United Nations Sustainable Development Goals -especially 14.

Blue bonds and economy finance remain comparatively recent with examples dating back to 2018. Few investors provide detailed specific information related to this sector, hence certain significant data collection challenges and omissions exist. In contrast green economy bonds date back to the initial 2007 Climate Awareness Bond for 600 million euros and a 2018 Fiji green bond for \$60 million. Others include social and sustainable bonds. Additional bonds are being proposed for the Caribbean, South Pacific and Africa such as Cape Verde, Sao Tome and Principe, Mauritius, Fiji and Grenada, although still in the conceptual phase.

Although funding may potentially exist; comparatively few investors have significant awareness or experience globally or stakeholders the familiarity or insight at present to mobilise sustainable blue or ocean finance, hence the significance and motivation for this article.

Aside from information, stakeholders frequently lack case studies of proven, viable projects that can yield sufficient returns, are scalable, replicable, with sufficient profits and incentives to attract market buyers and create a meaningful difference socially and ecologically. One study estimated green bonds raised over \$80.47 billion between 2016 to 2018 (Roth, Thiele and von Unger 2019) with over \$21.5 billion from China. The Oceans Assets Institute affirms the popularity of both green and blue bonds as a financing mechanism for island developing states such as in the Pacific (Adams 2019). It estimated a global market worth over \$200 billion just for green bonds. Other sources include blended finance, loans, equities, subsidies and more conventional investment types. To achieve the Sustainable Development Goal, it recognised the need for the private sector to breach the government finance gap of over \$2.5 trillion. Aside from the myriad economic benefits it could stabilise against numerous problems including climate change; conflict over resources, ocean governance, food security and chronic overpopulation. Over 50% of our oxygen and 30% of our emission absorptions derive from the oceans (Accenture Development Partnerships 2017). Fisheries support over 3 billion people. Mangroves contribute over \$1.6 billion each year globally in carbon reduction services. Over 340,000 to 980,000 hectares of marine ecosystem services are being destroyed each year. According to the International Blue Carbon initiative. Up to 67% of global mangroves, 35% of tidal marshes and 29% of seagrass meadows have been eradicated. Each hectare of mangroves eliminates 6-8 tons of CO₂ emissions per year. In forming a blue carbon or ecosystem based finance solution, sources also need to consider legal, policy, market, institutional factors, competitors and investment incentives; aside from accurate valuation of ecosystems and blue carbon potential over a future timespan. One source advises considering the way ecosystems are projected to change to various existing and future risks or investment (Herr, Himes-Cornell and Laffoley 2017).

It therefore becomes increasingly critical to reorientate and motivate finance away from hazards created. However, to progress forward, stakeholders will need to overcome not just a scarcity of financial sources and risk-averse behaviour but asymmetrical information over the fluctuating conditions of resources; accurate economic, social and ecological valuations of natural resources and which projects to prioritise. It also means overcoming the uncertainty as to how regulators will act or persuading the public to treasure their oceans as assets, avoiding moral hazard, ocean governance and the tragedy of the commons. Above all it remains

imperative to remain the ultimate objective remains ensuring long term prosperity and sustainability for ecosystems, stakeholders, economies, heritage, communities and livelihoods; avoiding worsening the problems of the oceans

III: Detailed Blue Economy Investment Trends and Analysis

Recommendations; limitations; stakeholders and potential prospects or opportunities

This section provides a more detailed insight into investment trends and analysis related to sustainable ocean or related blue economy activities for those in Table 2.2.

Ocean 5

In recognising the need to preserve marine ecological capital for future generations as the basis of the blue economy, it follows the global target of 30% of Earth's oceans by 2030 aided by the 2019 High Seas Treaty on Boundaries Beyond National Jurisdiction. Ocean 5 was formed in 2011. It focuses on strategies to support and finance marine protected areas in a specialised portfolio including fisheries management, related technology and conservation. Project examples include the Pacific, polar regions and the UK, with aims for the Caribbean and Latin America. It recognises the need to reduce threats by improving ocean governance to counter poaching and other hazards whilst indirectly contributing towards more sustainable fisheries. They report 9 global focused projects, 8 in Oceania and one proposed for Niue, 3 in Europe, 2 in Africa, 5 in North America, 4 in Asia and 12 in Latin America and the Caribbean. Project examples include the Northern Bering Sea Protected Area, the National Marine Monument Coalition, the Mesoamerican Reef, the Phoenix Islands, Tonga, Bahamas, Canadian Northwest Passage, Nicaragua, Cuba and West Africa. Other examples include supporting marine sanctuaries in South Africa and improving recording of Pacific tuna. A Plastics Solutions Fund aims to counteract the scourge of marine pollution. It also considered fisheries across St Helena, Patagonia and Adriatic. Oceans 5 projects are summarised in Table 3.1. In 2011 it provided \$889,100 to 5 projects in marine conservation and protected areas. In 2012 it reached 3 projects with \$7,730,300. In 2013 it extended to only 1 project with \$425,000. In 2014 it completed 8 projects worth \$10,820,500. In 2015 it managed 9 projects with \$4,816,000. In 2016 it supported 9 projects with \$10,076,650. In 2017 it invested in 24 projects with \$15,538,306. In 2018 it financed 19 projects for \$10,837,500. In 2019 it devoted at least \$9,731,100 to 10 projects and sustainable ocean finance.

Table 3.1 Ocean 5 Invested Projects

| | | | | |
|----------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------|----------------|
| Latin America and the Caribbean | United States, | The Nature Conservancy | 2019 | \$127,000.00 |
| North America | United States | Oahu Economic Development Board | 2019 | \$750,000.00 |
| Global | Shark Conservation Fund | | 2019 | \$2,500,000.00 |
| Asia | China | World Wildlife Fund | 2019 | \$1,500,000.00 |
| Europe | Mediterranean | MedReAct ONLUS | 2019 | \$1,102,120.00 |
| Latin America and the Caribbean, | Mexico, | Centro para la Biodiversidad Marina y la Conservacion | 2019 | \$286,400.00 |
| Latin America and the Caribbean, | Chile, Mexico, Belize, Brazil, United States, Costa Rica, Ecuador, Panama, Colombia | Global Fishing Watch | 2019 | \$1,201,000.00 |
| Oceania | Federated States of Micronesia, Republic of the Marshall Islands, Micronesia Conservation Trust, | | 2019, | \$897,000.00 |
| Global | Natural Resources Defence Council | | 2019 | \$57,000.00 |
| North America | Canada | Oceans North | 2019 | \$900,000.00 |
| Asia | Vietnam | Centre for Marine life Conservation and Community Development (MCD) | 2018 | \$150,000.00 |
| Africa | South Africa | Wildlands Conservation Trust (Wildtrust) | 2018 | \$972,000.00 |
| Global | Ocean Foundation | | 2018 | \$1,752,000.00 |
| Global | Oregon State University | | 2018 | \$1,031,000.00 |
| Latin America and the Caribbean | Costa Rica, | Friends of Cocos Island Foundation (FAICO) | 2018 | \$49,000.00 |
| Oceania | United Kingdom | International Union for Conservation of Nature (IUCN) | 2018 | \$781,000.00 |
| Asia | Indonesia | Global Fishing Watch | 2018 | \$23,000.00 |
| Oceania | Australia | Australian Marine Conservation Society (AMCS) | 2018 | \$100,000.00 |
| Europe | Russia | World Wildlife Fund | 2018 | \$1,096,000.00 |
| Europe | United Kingdom | Garden Court Chambers | 2018 | \$100,000.00 |
| Europe | Europe | Environmental Justice Foundation | 2018 | \$1,500,000.00 |
| Latin America and the Caribbean | United States | Oceana | 2018 | \$845,000.00 |
| Latin America and the Caribbean | Argentina | Conservation Land Trust | 2018 | \$163,000.00 |
| Latin America and the Caribbean | Mexico | Comunidad y Biodiversidad | 2018 | \$750,000.00 |
| Oceania | French Polynesia | UCSB Bren School | 2018 | \$50,000.00 |
| Oceania | Vanuatu | International Union for Conservation of Nature (IUCN) | 2018 | \$500,000.00 |
| Africa | Ghana, Benin, Cote d'Ivoire, Liberia, Nigeria, Togo | Trygg Mat Tracking (TMT) | 2018 | \$1,050,000.00 |
| Latin America and the Caribbean, | Dominica, Saint Lucia, Grenada, | The Nature Conservancy (TNC), | 2018 | \$900,000.00 |
| Latin America and the Caribbean, | Costa Rica, Panama, Colombia, Ecuador, | PACIFICO | 2018 | \$134,700.00 |
| Global | United States | Resources Legacy Fund | 2017 | \$600,000.00 |
| North America | United States | Resources Legacy Fund | 2017 | \$1,051,000.00 |
| Asia | Indonesia | Partnership for Governance Reform Indonesia - Kemitraan | 2017 | \$347,000.00 |
| North America | United States | Sierra Club Foundation | 2017 | \$100,000.00 |
| Global | The Henry L. Stimson Centre | | 2017 | \$200,000.00 |
| Asia | Japan | GR Japan K.K. | 2017 | \$1,590,000.00 |
| Global | Antarctica | Antarctic and Southern Ocean Coalition | 2017 | \$909,000.00 |
| Global | The Centre for Advanced Defence Studies (C4ADS) | | 2017 | \$126,000.00 |
| Asia | South Korea | Citizens' Institute for Environmental Studies (CIES) | 2017 | \$385,000.00 |
| Asia | Taiwan | Environmental & Animal Society of Taiwan (EAST) | 2017 | \$322,000.00 |
| Asia | Japan | Seafood Legacy Co., Ltd. | 2017 | \$260,000.00 |
| Oceania | Pacific Islands Forum Fisheries Agency (FFA) | | 2017 | \$178,000.00 |
| Oceania | Pew Charitable Trusts | | 2017 | \$1,671,000.00 |
| Global | Plastic Solutions Fund | | 2017 | \$1,500,000.00 |
| Europe | International Pole & Line Foundation (INPLF) | | 2017 | \$540,000.00 |

| | | | | |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------|------|----------------|
| Latin America and the Caribbean | Uruguay | The Gaia Foundation | 2017 | \$224,000.00 |
| Oceania | The Nature Conservancy (TNC) | | 2017 | \$300,000.00 |
| Latin America and the Caribbean | Cuba | Environmental Defence Fund | 2017 | \$460,000.00 |
| Asia | Japan | The Nature Conservancy (TNC) | 2017 | \$225,000.00 |
| Latin America and the Caribbean | Cuba | Wildlife Conservation Society (WCS) | 2017 | \$500,000.00 |
| Oceania | Palau | Palau Protected Areas Network Fund | 2017 | \$851,000.00 |
| Latin America and the Caribbean | Mexico, Guatemala, Honduras, Dominican Republic, Costa Rica, Panama, Colombia | AIDA (Interamerican Association for Environmental Defence) | 2017 | \$443,670.00 |
| Oceania | Papua New Guinea, Solomon Islands | Wildlife Conservation Society (WCS) | 2017 | \$826,121.00 |
| Argentina, Chile | | Wildlife Conservation Society (WCS) | 2017 | \$988,515.00 |
| North America | United States | Meridian Institute | 2016 | \$251,000.00 |
| Global | United States | Marine Conservation Institute | 2016 | \$60,000.00 |
| North America | Canada | Ecology Action Centre | 2016 | \$1,553,000.00 |
| Asia | China | Natural Resources Defence Council | 2016 | \$271,000.00 |
| Latin America and the Caribbean | The Bahamas | The Nature Conservancy (TNC) | 2016 | \$1,200,000.00 |
| Latin America and the Caribbean | Honduras, Belize | Smithsonian Institution | 2016 | \$1,300,000.00 |
| Europe | Italy, Croatia, Albania | MedReAct | 2016 | \$439,000.00 |
| Global | | Shark Conservation Fund | 2016 | \$2,500,000.00 |
| Oceania | Niue | Tofia Niue Association | 2016 | \$504,650.00 |
| North America | United States | Conservation Law Foundation | 2015 | \$354,000.00 |
| Global | | Deep Sea Conservation Coalition | 2015 | \$325,000.00 |
| North America | United States | Natural Resources Defence Council | 2015 | \$150,000.00 |
| North America | United States | Native American Rights Fund | 2015 | \$228,000.00 |
| North America | United States | Centre for American Progress | 2015 | \$118,000.00 |
| North America | United States | The Board of Trustees of Leland Stanford Junior University | 2015 | \$140,000.00 |
| Global | | Sapling Foundation | 2015 | \$200,000.00 |
| Oceania | Kiribati | Phoenix Islands Protected Area Conservation Trust (PIPA Trust) | 2015 | \$2,500,000.00 |
| Global | United States, Canada, Norway, Russia, Iceland, Denmark, Sweden | Peace Development Fund, Inc. | 2015 | \$801,000.00 |
| Global | United Kingdom | Royal Society for the Protection of Birds | 2014 | \$162,000.00 |
| Oceania | United Kingdom | Fauna & Flora International | 2014 | \$1,500,000.00 |
| Europe | European Union | Environmental Justice Foundation | 2014 | \$4,200,500.00 |
| Africa | Seychelles | The Nature Conservancy (TNC) | 2014 | \$500,000.00 |
| Oceania | Cook Islands | Marae Moana Establishment Trust | 2014 | \$945,000.00 |
| Europe | Russia | World Wildlife Fund, Inc. | 2014 | \$900,000.00 |
| Latin America and the Caribbean, Costa Rica, Panama, Colombia, Ecuador, | | MarViva Foundation | 2014 | \$875,000.00 |
| North America | Canada, Greenland | Pew Charitable Trusts | 2014 | \$1,000,000.00 |
| Oceania | Cook Islands | Te Ipukarea Society | 2013 | \$425,000.00 |
| Global | | Wildlife Conservation Society (WCS) | 2012 | \$820,000.00 |
| Global | | Pew Charitable Trusts | 2012 | \$2,050,000.00 |
| Latin America and the Caribbean, Costa Rica, Panama, Colombia, Ecuador, | | Conservation International | 2012 | \$4,433,000.00 |
| North America | United States | Marine Fish Conservation Network | 2011 | \$400,000.00 |
| North America | United States | Greenpeace Fund, Inc. | 2011 | \$500,000.00 |
| Global | Antarctica | Antarctic and Southern Ocean Coalition | 2011 | \$3,569,000.00 |
| North America | United States | Oceana | 2011 | \$2,250,000.00 |
| North America | United States | World Wildlife Fund | 2011 | \$2,170,100.00 |

Ocean 14 Capital

In contrast Ocean 14 Capital prove less transparency and information but indicate a similar interest in committing to the blue economy, but via food security, marine ecosystems and technology. Examples include fish food, aquaculture and blue carbon sequestration along with technology, marine plastic pollution reduction and the circular economy. It initially raised around \$200,000,000 and evaluating up to 300 potential investments. It focuses on companies seeking around \$10-\$15 million, with a market cap value of \$30-50 million.

Blue Natural Capital Financing Facility

The Blue Natural Capital Financing Facility (BNCFF) also concentrates on marine ecosystems including blue carbon, aquaculture, marine protected areas, biodiversity, conservation and coastal projects. It provides far more extensive information on its investment approach and specific projects. One example includes a project conserving 55 hectares of mangroves combined with shrimp aquaculture simultaneously (Selva Shrimp) in Kalimantan Indonesia. It ultimately aims to extend the concept to a further 150,000 hectares of mangroves. It proves local community income, poverty reduction, food security, organic products, social development and ecosystem protection can be synonymous. Another project Net Works focuses on reducing the marine litter, entanglement, laceration, congestion, toxin, public health, choking and other hazards of lost and abandoned fishing nets by recycling them along with establishing a seaweed business for aquaculture and community mangrove protection areas as conditions for support. It hopes to reduce yearly emissions of 150,000 tonnes of Carbon dioxide by creating around 775 hectares of mangroves by 2020 across the Philippines with the aim of 100,000. The recycled fishing nets then become part of the circular economy in supply chains, converted into new use goods. The organisation also perceives further investment potential exists in marine conservation via selling blue carbon credits to offset global emission contributions towards climate change as with traditional afforestation and carbon market schemes. It provides up to 70,000 euros per submission for project incubation stages or initial research, with the emphasis on business potential viable for at least 10 years.

Mirova

Mirova, the parent company of Althelia and the Sustainable Oceans Fund also focuses on blended finance, sustainable fisheries and aquaculture. It manages over €12.5 billion of assets and investments based on adhering to the 2015 Paris Agreement. Project examples include biodiversity and renewable energy.

Althelia Funds

Mirova Natural Capital operating Althelia Funds additionally focus on natural capital and emissions reduction targeting as the basis for their sustainable blue economy investments, although most of their existing experience is centred around climate change and the green economy. One example included the aim of 4000,000 tonnes of CO₂ emission reduction by conserving 110,000 hectares of Amazon rainforest and incentivising 7 indigenous tribal communities with an investment of \$7,000,000 in 2019. The fund targets Africa, South America and Asia via a Sustainable Oceans Fund of at least \$92,000,000. Cited initial investments include decreasing the abysmal rates of species perishing to bycatch loss along with sustainable Mexican aquaculture but the investor has only recently expanded into blue economy activities, with far more concentration in investing in land conservation areas and sustainable technology innovation since 2014. The Fund will further focus on additional generated options for the circular economy, sustainable seafood and ocean conservation. Initially it is engaged with 5 projects, aiming to increase it between 15-20 projects over 8 years. Although limited empirical evidence exists of targets being achieved it ambitiously seeks to focus on blue carbon investment with over 175,000 hectares of marine conservation areas including 17,500 of mangroves. This aims to focus on 177,000 tonnes of aquaculture and sustainable fisheries to support over 19,500 jobs and carbon emission offset credits of 9,000,000 tonnes directly and over 3,600,000 tonnes indirectly due to reduced meat production. In September 2018 Althelia created the Sustainable Ocean Fund with \$100,000,000 of initial capital. As part of this it invested 5 million euros in a Scotland “Recycling Technologies” company converting plastic into waxes and petrochemical feedstocks (Neste Corp). Mexico located Kampachi Company focused on kampachi sashimi aquaculture with an initial output stock of 200,000 fish. An alternative investment was Safety-Net Technologies to counter fisheries bycatch.

International Blue Carbon Initiative (BCI)

The International Blue Carbon Initiative is similar in endorsing the ecosystem based approach to sustainable ocean finance following the UNEP Blue Economy Investment Principles and the 2015 Paris Agreement on climate change. It aims to focus on assessing the extent of blue carbon credit potential across various areas as inducements for conservation and how these can be made profitable via reducing impacts and

contributions from eco-tourism. It also believes in countering climate change by preserving more ocean areas; although most of the world's financing sources concentrate on land centred emission sinks and ecosystems. It especially recognises the need to educate, research, raise funding, coordinate and mobilise support towards marine ecosystem protection especially 4,920,000 global hectares of seagrass, mangroves, salt marshes, coral reefs and sensitive coastal habitats. It estimates an average biodiversity loss rate of at least 2% per year for each. Coral reefs are projected to vanish by 2030. It therefore indirectly mobilises funding towards marine conservation, ecological rehabilitation and blue carbon stock assessments. Limited financial evidence was located to determine the direct contribution or extent of their commitment and meaningful change. Project examples include Tampa Bay and Herring River Estuary Restoration in the USA, a Costa Rica based Blue Carbon evaluation for the Gulf of Nicoya, the Kaimana Coastal Conservation and Community Development in Indonesia and Tomago Wetland Restoration in Australia. The Initiative has established a Coastal Carbon Research Network and various online resources to further assist this area. One example includes the IUCN National Blue Carbon Policy Assessment Framework and Tool. It is also the basis of an April 2020 World Economic Forum Friends of Ocean Action Ocean Finance handbook. Various events have been hosted to raise greater awareness, interest and funding commitment.

Blue Solutions

Blue Solutions similarly concentrates on financing solutions linked to marine biodiversity along with research, course training, ecotourism and volunteer experiences along with open source training materials. Courses include Blue Planning, Blue Integrated Ecosystems, Blue Climate Change Adaptation and Conservation Finance. It included marine spatial planning workshops and capacity building in Zanzibar, Myanmar, Brazil, the Benguela Current area, Gulf of California, Mesoamerican Reef and the Seychelles. Although as with other examples it is conducting admirable and commendable work so far, limited transparency exists over the extent of financing successes and failures so far. In 2014 it supported the Young Professionals Marine Challenge, Caribbean marine pollution and ICT solutions for inland fisheries in Uganda. In 2020 it offered training in Bali. The Gulf of California Marine Endowment devotes \$9,500,000 towards the formation and preservation of 51 marine and land reserves around Mexico. The Mesoamerican Reef Fund similarly devotes \$41,500,000 to ocean conservation but concentrates on coral reefs.

Blue Solutions concerns itself with investing in and supporting marine ecosystem conservation, blue carbon, resource management, protected areas and related community/individual initiatives linked to crowd funding,

blue carbon credits and other funding sources. Specific efforts include contributions to the Gulf of California marine endowment, the previously mentioned Net Works and Mesoamerican Reef Fund. It cites successful partnerships and other case studies such as the Caribbean Challenge Initiative/Caribbean Biodiversity Fund for \$1,500,000 - \$1,800,000 each year and a \$26,500,000 sinking fund to eco-tourism and marine ecosystem-based solutions to climate change and other coastal/ocean threats. Finance approaches include fundraising, monitoring, mentoring, research, marketing and communication, monitoring and evaluation. Another example from Kenya focuses on the Mikoko Pamoja community in preserving mangroves to earn financed blue carbon offset credits against climate change risks. It aims to save 50,000 tons of CO₂ emissions over the next 20 years. In the Seychelles the Cousin Island Special reserve received online volunteer donor funding for 25,000 pounds from 95 volunteers in 2015 within 50 days, allocated to a solar panel system. Chumbe Island Coral park off Zanzibar received ecotourism support in exchange for a private marine protected area. It employed 42 people directly, supporting around 400 indirectly. In Guasave Mexico, the El Caracol fishing community gained funding support for a fishmeal processing facility to reduce bycatch waste up to 1000 tons per year and employing 3-15 people. Net-Works focuses on recycling fishing nets in Cameroun and the Philippines from abandoned/discarded fishing gear. Blue Solutions also published a series of case study solutions financed in 2016 including protecting Denis and North Islands in the Seychelles, another area in Senegal and Datan algal reef in Taiwan. It includes community mangrove approaches in Egypt and Ghana along with marine turtles in Sierra Leone

IUCN Blue Action Fund

The International Union for the Conservation of Nature, Blue Action Fund is only recently established with an initial endowment of 65,000,000 euros committed to establishing marine protected areas and conserving biodiversity. It is currently financed by France, Germany and Sweden.

The Meloy Fund

The Meloy Fund for Sustainable Community Fisheries prefers to focus more on the socioeconomic prospects of preserving communities, economic activity, livelihoods, heritage and ecosystems simultaneously. It has targeted 100,000 individual people dependent on fisheries and 1.2 million hectares of community managed fisheries across the Philippines and Indonesia. The Fish Forever Scheme seeks to improve ecological literacy and ocean governance. Related projects include ecotourism, the circular economy via pollution and waste reduction or recycling, aquaculture and blue carbon offsetting. It favours individual investments with potential

to influence at least 500-2000 people and around \$1-\$5,000,000 per investment. In 2017 it financed its first seafood processing firm Meliomar Inc and company protected area in the Philippines for yellowfin tuna. Measured impacts include a 75% increased sale in one year, and 8,600 jobs. It aims to improve seafood sustainability and traceability. A second was Agita, an Indonesia octopus processing firm seeking sustainability across 250,000 hectares of seas. In 2020 it favoured ensuring greater sustainability of PT SIG Asia, a tuna processor based in North Sulawesi, Indonesia and its dependent supply chain. As of April 2020, the Fund included at least \$22 million to specifically invest in the Indonesia and Philippines, although hoping to expand as more resources become available. It has its own Investor Guidelines for Sustainable Fisheries. It aims to gain more of a projected market of \$4 billion. It benefitted from a \$6,000,000 Global Environment Facility initial grant from 2016-2017 for Indonesia fisheries.

Pro-Azul

In response to the global and African regional interest in the blue economy, President Felipe Nyusi of Mozambique announced the POLMAR Strategy in 2017. Promulgated in 2018 this aims to “promote a safe sea, managed in an integrated and responsible manner, with social and economic benefits to Mozambique towards sustainable development. In November 2019 the World Bank announced the Pro-Azul Strategy and Blue Economy Development Fund to provide a practical road map of core actions and recommendations to implement the proposed blue economy, publishing a tender to appoint certain consultants. Concurrently, the Pro-Azul Fund was launched to coordinate and mobilise blue economy finance for Mozambique. It is currently undertaking 2 projects since inception in 2017/2018 related to sustainable fisheries and ecotourism. The Mais Peixe Sustentável program provides commercial and community subsidies or loans across 17 regions, claiming to have allocated \$1.7 million to 1,086 beneficiaries. Alternatively, the SWIOFISH project from 2015 to 2021 focuses on a regional approach to aiding marine resource management and ocean governance in Mozambique and beyond with a cited 7 main projects, \$49 million in budget and benefitting 24,546 people. Related to these projects is the 4 year Coastal Resilience to Climate Change Initiative to invest in mitigation via ecosystem conservation and adaptation. These aim to assist fisherfolk to ensure future generations of fishery species remain prosperous. Another new emerging activity is Vilankulos marine ecotourism.

Blue Oceans Partners

Blue Oceans Partners in France focuses on harnessing solutions to blue economy risks, problems and opportunities especially in marine pollution including plastic, aquaculture and overfishing. It provides only minimal information as to its specific projects, performance and criteria. Ocean One its specific fund commits 1-6,000,000 euros per project, with total initial capital around 40,000,000 euros. Investable propositions have ranged from ghost nets and discarded fishing gear, to aquaculture feeds and plastic pollution reduction.

Alpha Blue Oceans

Alpha Blue Oceans offers a similar investment strategy to blue economy activities with around 1 billion in assets and 21 in project commitments for 45 projects but keeping information confidential for its clients.

Blue Oceans Capital

Blue Ocean Capital focuses specifically on ports, shipping, logistics and related maritime finance investments primarily across the Trans-European Transport Network. It hopes to capitalise on a projected EU investment commitment up to \$26 billion by 2022. It facilitated a deal for Estonia's largest terminal operator Transiidikeskuse AS by Germany's Hamburger Hafen und Logistik AG.

Caribbean Development Bank

The Caribbean Development Bank in Jamaica is radically prioritising the region-specific blue economy through investments, research, blue bond potential and considering national accounts and macroeconomic contributions as potential. It especially wishes to focus on fisheries and aquaculture, tourism, marine renewable energy and transport/ports. It will base investments on coastal and marine resource management, ocean governance and marine spatial planning. It is directly supporting small and medium enterprises via the Compete Caribbean initiative of 13 Caribbean territories, 43 projects and \$14.7 million. The Compete Caribbean Partnership Facility is currently supporting blue economy projects in St. Lucia, Belize, and Barbados. Canada donated \$6 million to aid related small and medium companies in various blue economy areas.

Commonwealth Secretariat -Commonwealth Marine Economies Programme

The Commonwealth Marine Economies Programme was launched in 2016 for 17 Pacific and Caribbean nations with 8 Plans under draft and 9 baseline reports established. These nations include Antigua and Barbuda, Belize, Dominica, Fiji, Grenada, Guyana, Jamaica, Kiribati, Nauru, Papua New Guinea, St Lucia,

St Vincent and the Grenadines, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The programme included Hydrographic Action and Environment Action Plans and projects in coastal hazards risk monitoring, tourism, fisheries, coastal planning, ecosystem protection, aquaculture and sustainable blue finance -i.e. carbon bonds among others. These aim to reduce vulnerability and enhance resilience of coastal communities. It is providing a socioeconomic valuation and coastal marine or oceanographic surveys along with investment support as initial preparation in enforcing governance over their existing and extended Exclusive Economic Zones. It focuses on valuation and chartering; then determining action plans the prioritisation of core resources and targets. Stakeholders have pledged common enforcement, monitoring, awareness and assistance via a Commonwealth Blue Charter. It aims to provide investments to support national Marine Economy Plans and a Data Portal/coastal data hub including sea level, tidal and other core data.

European Investment Bank

In 2019 the European Investment Bank signalled its interest in the blue economy via its 2019-2023 Sustainable Ocean Strategy and Clean and Sustainable Ocean Programme with 2.5 billion of pledged finance in green shipping, seafood aquaculture, blue biotechnology and coastal protection, especially within European waters, interests and territories. This includes not just financial via long term loans/blended finance but technical advice. It targets partners, government entities local, regional and municipal along with businesses. It specifically commits to 20 projects in 13 countries including 2.67 billion euros in offshore wind energy, 682 million in green shipping (cleaner fuels and energy powered) and 295 million for sustainable seafood production. From 2003-2019 31 offshore wind projects were financed for 11 billion euros. Other project examples include improving wastewater management loans via the Kitchener Drain in Egypt, Cape Town (80 million), Cotonou Benin (50 million), Moratuwa and Ratmalana Sri Lanka (151 million) and Buenos Aires. (80 million). Other projects include 2 new eco-efficient ferries for Ireland's Irish Continental Group and 110,000,000 euros towards green shipping for Spliethoff and ABN AMRO.

European Bank for Reconstruction and Development.

Although it is pledged to supporting the blue economy, limited direct evidence could be located.

Horizon 2020

Horizon 2020 represents the European Union investment strategy from 2014-2020 for many areas including the marine/blue economy. It includes several specifically allocated funds and strategies. INEA targets 7 projects including BRIDGES, Dex-ROV, GRACE, LINCOLN, MARIBE, MUSES and NEXUS, covering transport, renewable energy, marine tourism, investment from other participants, biotechnology, fisheries, aquaculture and seabed mining. It incorporates research, marine conservation and spatial planning. It has financed maritime security and coastguard efforts, traffic, pollution and migrant monitoring and resolution. It has financed SafeSeaNet for security, Marine Pollution Common Emergency Communication and Information System and EMSA/SAFEMED for environmental data. It is financing and supporting the creation of maritime clusters under the European Maritime and Fisheries Fund (EMFF), ENI, ERDF, National funds, European Fund for Strategic Investments (EFSI) and European Fund for Sustainable Development (EFSD). It also allows for skills development, training and education under EMFF, Blue Growth Initiative — FAO, European Social Fund (ESF), ENI, ERASMUS+, Connecting Europe Facility (CEF) and National funds.

Other initiatives include artificial reefs, marine protected areas, drones, offshore wind, wave and tidal energy, small marinas, nautical and cruise tourism and waste reduction/the circular economy under EMFF, COSME, CEF, LIFE, ENI, ERDF, EU Horizon 2020, National funds, Blue Growth Initiative — FAO, European Investment Project Portal, EFSI and EFSD. It is also financing greater information for risk management, science and innovation via the European Marine Observation and Data Network – EMODNET and the Virtual Knowledge Centre and a Blue Economy Investment Platform under the EMFF, ENI, ERDF, LIFE, EU Horizon 2020, National Funds and Green Climate Fund. It aims to protect up to 100% of the Mediterranean under Integrated Coastal management by 2021 with 10% as marine protected areas. The MARIBE project focused on Marine finance or investment for the blue economy specifically prioritising marine renewable energy, aquaculture, biotechnology and seabed mining. From 2015-2017 it received €1,977,951. The European Maritime and Fisheries Fund allocated a €22.5 million budget for small and medium enterprises in 2019. Applicants can receive €700,000 and €2,500,000 for their projects under Blue Invest grants but must be registered within Europe.

MUSES or “Multi-Use in European Spaces,” investigated funding for marine spatial planning and integrated coastal zone management from November 2016 to October 2018, with a budget of €1,987,604. NEXUS

focused on marine renewable energy projects such as operation and service vessels for offshore windfarms. From November 2017 to November 2020 it will receive a budget of €4,403,394. LINCOLN targets Lean Innovative Connected Vessels for service crew catamarans and survey vessels for offshore energy projects. From 2016-2019 it will receive a budget of €7,808,691. In contrast GRACE focuses on pollution from integrated oil spill incidents via improved simulation and observation of ecological externality costs. From March 2016 to August 2019 it received a budget of €5,513,253. Dex-ROV utilises drones for communications and other seep sea activities, with initial investments of €5,336,006 from March 2015 to August 2018. BRIDGES conceptualised and implemented an autonomous underwater glider envisioned to aid deep sea mining and exploration. It received €7,791,810 from March 2015 to August 2019

World Bank Pro-Blue Programme

Among the most transparent and significant investment efforts towards the blue economy is the World Bank PRO-BLUE currently committing \$5.6 billion by March 2020. Pledged future investments include a further \$1.6 billion. It targets marine pollution; sustainable fisheries and aquaculture; other blue economy activities and ecosystems/ocean governance and marine conservation. Examples include a scheme to provide Caribbean community fisheries and value chain insurance or COAST (Caribbean Oceans and Aquaculture Sustainability Facility) pioneered in St Lucia and Grenada. In its annual published report for 2019 the PROBLUE programme, donors pledged \$51,140,736 but received only \$28,490,094. It devoted US\$ 1,370,000,000 to finance aquaculture and fisheries; \$4,950,000 for plastics and other marine pollution; \$500,000 to ports and shipping; \$800,000 to offshore wind energy, \$400,000 to coastal tourism, \$500,000 to desalination and \$1,210,000 towards blue economy policy frameworks, ecosystems, technology and finance. Specific project examples include investigating harmful fisheries subsidies, a Fisheries Status Assessment Toolkit, a blue finance facility proposal, blue natural capital stock assessments and plastic solutions. It is also contributing indirectly to Mozambique's PRO-AZUL Fund, SWIOFISH and blue economy framework and the Organisation of Eastern Caribbean State's blue economy roadmaps and strategies for Grenada, Antigua and Barbuda, Dominica, the Dominican Republic, St Lucia, St Vincent and the Grenadines.

Blue Prosperity Coalition

The Blue Prosperity Coalition under the Waitt Institute, Oceans 5, UCLA and others forms a private sector, blue economy finance initiative committed to generating further ocean sanctuaries, marine protected areas and other conservation initiatives, to directly contribute towards the global target of 30% by 2030. This

encapsulates marine spatial planning, ocean governance and technical support by a variety of global stakeholders. As part of its investment selection and implementation process it conducts marine ecological and fisheries/ocean use assessments, community engagement, developing finance and support processes, monitoring and enforcement prior to the marine spatial plan and area development. From 2020-2030 it aims to provide \$150,000,000 to conserve 1,540,000 km² of ocean territory. Specific project achievements include 33% of Barbuda's Exclusive Economic Zone in 2014, Curacao, Montserrat, Tonga, the Azores, Bermuda, Federated States of Micronesia and Maldives. In May 2019, the Federated States of Micronesia committed to 897,000 Km². The Maldives committed to around 385,000 Km². In June 2019 Bermuda pledged to avoiding fishing and other unsustainable activities in 20% or 90,000 Km². This further extends upon its existing 29 marine protected areas and 2010 valuation of its annual coral reef value over \$722,000,000 per year. The Azores also aim to protect 90,000 Km² or 15% of its terrain.

Alimentos Ventures

Alimentos Ventures concentrates on sustainable fisheries, aquaculture, technology and blue biotechnology via start up, entrepreneur and incubation capital along with mentoring and facilitating finance among investors. One project was unearthed directly. In 2017 it allocated \$1,200,000 to MicroSynbiotiX in partnership with Enterprise Ireland, RebelBio, SOSV, and The Yield Lab. Indirectly it also supported HATCH, an aquaculture linked accelerator and incubation seed financing source. Project examples include a microalgae based chemical biotechnology firm Kuehnle in Hawaii, tilapia diagnostic test kits by Gaskiya in Baltimore and Impact 9 -offshore aquaculture and fisheries container mooring solutions in Ireland. Others include Bangkok aquaculture (Algaeba), Norway Dynaspace -shrimp information monitoring and an online seafood market -Catchatrade in China. In 2020 it raised around \$8,400,000 in funding to sustain a 3 month programme with (\$75,000 in cash, \$55,000 in kind, office space, marketing and networking).

Blue Bio Value

Blue Bio Value is similar in its scope and approach to Alimentos Ventures and is based in Lisbon, Portugal. It is especially committed to the blue bioeconomy where start up investors can pitch their ideas. In 2019 it received over 110 projects but financed only 15 enterprises from 9 nations including Portugal, Spain, Denmark, Switzerland, Italy, Canada, Brazil, United Kingdom and India). Each participant receives € 7,500 direct and up to 45,000 € for costs. Examples include aquaculture nutrition, cosmetics, pharmaceuticals, biofertilisers and more sustainable glitter.

Blue Economy Zone Industrial Fund.

China's Blue Economy Zone Industrial Fund may encompass diverse blue economy activities but is constrained in being geographically restricted to Shandong Peninsula. Achievements include focusing on fisheries, aquaculture, marine biotechnology and microbiology research; the marine chemicals industry, engineering, the environment, renewable energy and infrastructure.

Aloe Private Equity

Aloe Private Equity focuses on sustainable finance activities including most recently in the blue economy for the Asian region since 2003. It hosts a subsidiary which had an initial capital flow of 60 and later 190 million euros for renewable energy orientated investments but provides comparatively minimal information about its progress.

Bonafide Ltd

Bonafide Ltd operating since 2008, is another blended financing source yet to simplify guidance for the committed research analyst or stakeholder in committing to the UNEP Blue Economy Finance Principles of transparency and providing sufficient investment. It concentrates on viable fisheries and aquaculture. Project examples include the especially lucrative and high market demand for Pacific bluefin tuna, Sabeh shrimp in Borneo, Chilean salmon farming and South Australian oysters. Another includes yellowtail kingfish ranching for sashimi/sushi. Monetary commitments are more obscure to unearth. It also supported an entrepreneur concept for salmon from Japanese vending machines.

Fishing Accelerator

The Fishing Accelerator echoes the above investment firms in its blue economy focus of sustainable fisheries but focuses on venture capital, technology and other start-ups and related pioneering project support such as capital, networking, marketing and mentoring. Its range of pursuits have linked to ocean data mining, autonomous vessels, navigation, energy efficiency, fishing gear, parasite monitoring, medicine, robotics/automation and improved storage, quality, logistics along with processing.

Greenbackers Investment Capital

A parallel structured venture capital firm is Greenbackers Investment Capital including the Greenbacker's Cleantech Fund for technology innovation. It has mostly concentrated on the green, circular and climate economy but is working towards the ocean/blue economy especially projects in renewable energy such as offshore wind and wave production. It apparently cites over 500 companies with initial pitch introductions of 2 to 200,000,000 pounds for those who have advanced beyond the incubation/entrepreneurship stage and are looking to scale up more considerably/globally. Previous project examples include recycling, heat efficiency, and a company supporting marine and wind turbines via a patent oil filtration system; a logistics fleet optimisation telematic data network and another including a vessel exhaust monitoring sensor system to reduce emissions. Another includes a seaweed processing firm. In November 2017 it financed Bombora Wave Power, attracting £10.3 million of EU funds to support its 2½ year, £15 million, 1.5MW mWave™ wave energy powered demonstration project off Wales.

International Capital Market Association

This represents a source of generic information about stakeholders interested in generic sustainable finance, the Green, Social and Sustainability Bond types and Principles/guidance although it has indicated interest in developing blue economy bond equivalents although these have yet to occur.

Investas – Association luxembourgeoise des investisseurs privés,

This Luxembourg firm is another expressing potential interest in the blue economy but provides no specific information.

Katapult Ocean

Katapult Ocean founded in Norway in April 2018 extends to a variety of ocean industry, blue economy and technology investments across 7 nations and 4 continents with 23 commitments and fair evidence of partnerships or collaboration. It focuses on the start-up entrepreneur stage of development via a 3 month programme. Areas of cited interest include wave and tidal energy, shipping, ferries and transport, tourism, biotechnology, desalination, undersea exploration, technology, fisheries, aquaculture, floating cities, desalination and eco-conservation. It consists of around \$4,000,000 in venture capital, trading 8% equity for

\$150,000 to \$300,000. It provides significant evidence of its specific investments including an electric boat propulsion system Evoy, anti-poaching drones (Atlan Space Morocco), Alga-life (textiles) and Tracio (blockchain enabled supply chain product traceability system). Others include an online waste marketplace in Myanmar (Recyglo), a UK plastic waste powered system (Ichthion), fisheries AI telematics (Fishency), Nautix ship management software and Remora XYZ from Costa Rica -another seafood traceability system. Further investments extended to seaweed packaging (Oceanium UK) and ARC or artificial reef creation. In 2019 Katapult Ocean aimed for 12 start-ups. Shiok Meats in Singapore is creating artificial cell created crustaceans via blue biotechnology.

Mermaid Investments

Mermaid Investments focuses on various initial and early commercialisation stage investors over 1-3 years per each investment including marine technology and robotics, fisheries, aquaculture, seabed minerals, marine renewable energy, biomaterials and biotechnology.

Ocean Assets Institute

The Ocean Assets Institute positions itself as a research entity concentrating on sustainable ocean or blue economy finance. For example, it created 3 blue economy or ocean bonds recently for the Pacific Ocean Finance Programme. Other areas include aquaculture, maritime finance, ports, marine renewable energy, waste, 0 emission vessels and coastal ecosystems and conservation along with blue carbon. It publishes a database of 450 blue economy finance stakeholders for 95 Swiss francs.

Oceans Exchange

Oceans Exchange focuses on seed innovation to ocean and blue economy start up entrepreneurs, especially targeting 10-12 finalists with capital of \$1,500,000 originally -with 2 prizes of \$100,000 each. Financed innovations includes an alternative storage battery (Cyclotron Road), Jolt Energy Storage Technologies, Atlas Energy Systems and the hydro-powered Vortex Turbine. In 2013 ECO-SUBSEA devised an eco-friendlier means of underwater hull cleaning. The source primarily seems to award energy and shipping related solutions although in 2018 it awarded a Bahamas centred firm Coral Vita for coral reef restoration. Alternative solutions range from marine wind power to biodegradable plastics, retractable ship fins and fisheries bycatch reduction.

Ocean Hub Africa

Ocean Hub Africa was only recently started in Cape Town South Africa as the first related blue economy entrepreneurship, accelerator and incubator hub for start-ups and is far too recent to have made progress, although initially aiming for 6 projects to support. It proposes a 6 month programme and is open to participants across all blue/ocean economy sector activities. Support extends to partnership and mentoring, finance, cloud service, the Internet of Things and engineering software. It connects to Blue Oceans Partners, Ocean 14 Capital and elsewhere.

Rockefeller Asset/Capital Management

Rockefeller Asset Management and Capital Management focus the blue economy via the Rockefeller Ocean Strategy, apparently targeting all areas including ocean conservation and health profitably in the long term, although providing comparatively minimal guidance as to how funding is selected or applications made directly. The Strategy especially targets ecosystem management, resource sustainability; low carbon energy, water and energy efficiency aside from water management and services. As with the other above firms it vocalises the need for extensive research prior to committing an investment. It identifies opportunities not only in the problems faced by global oceans, marine assets and species but also linked to the regulations that policymakers are predicted to respond with as has been emphasised with shipping reductions. The Rockefeller Foundation also proclaims an Oceans and Fisheries initiative for the fishing sector and marine conservation. For its strategy, it cited interest in 10 companies worth around \$50 billion in 2014 in revenue as part of an initial investment. These are Xylem, Stericycle, Novozymes, Thermo Fisher Scientific, Pentair, A.O. Smith, Alfa Laval, Kubota, Aqua America and China Everbright International. These companies range from marine biotechnology, waste recycling, wastewater purification, renewable energy and sustainable environment technology. It provides comparatively convincing evidence of the prospects and innovations of each but as with many firms targeting the affluent, reduces transparency and options for others wishing to invest.

Invest in Vibrant Oceans

Invest in Vibrant Oceans selects an integrated sustainable fisheries, aquaculture and ecosystems approach including port infrastructure, technology and data. It provides very limited information

Encourage Capital

Encourage Capital is a private venture equity firm specifically targeting fisheries, renewable energy and aquaculture with Guidelines for Investing in Sustainable Fisheries. Investor examples include Kaplan Hydro Company in India financed from 2008 to 2011. It financed the previously mentioned Pescador Holdings - sustainable seafood and Geomar in Chile linking directly to 700 artisanal fisherfolk.

Bloomberg Philanthropies

Bloomberg Philanthropies mirrors Rockefeller Asset/Capital Management in being an initiative that selects its investments more than it can be approached to fund individual approaches. It started in 2014 with initial capital of \$ 64,000,000. Its Vibrant Oceans Initiative selects fisheries management and ocean governance via community projects. It targets Brazil, Chile and the Philippines via specific investment strategies for small scale fisheries (the Mangue, Mariscos and Isda Strategies respectively). For industrial fisheries strategies include the Sapo (Brazil), Merluza (Chile) and Nexus (Philippines) respectively. Claimed impacts include up to 390% growth of observed local fish species in selected areas. Its Phase II approach commits \$86,000,000 towards coral reef conservation, marine protection and fishing supply chain transparency for Australia, the Bahamas, Chile, Fiji, French Polynesia, Indonesia, Philippines, Tanzania, Peru and the United States from October 2018 onwards. It cites the need to try and minimise overfishing and pollutions, networking to aim to change policies where possible including Dalio Philanthropies and Ocean X Media. In 2016 it supported an online fisheries vessel monitoring platform -Global Fishing Watch to try and incentivise greater awareness and accountability. It also committed to research investigating coral reefs needing protection

Ocean X Media

This company cites comparatively sparse information other than committing \$149 million towards research, marketing, awareness and exploration to support Bloomberg Philanthropies' Vibrant Oceans Initiative.

Sea-Ahead

Sea Ahead creates another venture capital and angel investment firm related to the blue economy especially in technology and innovation. It identified over 500 initial investments. However, it initially looked to support far fewer including Legitfish, Resolute, OnVector, Arc Marine, Pliant Energy Systems, Adaptive Surface Technologies, FLITE, Terradepth. ShipIn, Synthetik, Port Call, Freight Flows and SEATRAC. Others include Oyster Tracker, DURO-UAS, BLK Sail, Ashored and Moran Cyber.

SKY – Ocean Rescue Fund

Sky Ocean Rescue Fund is especially targeting marine pollution and plastic reduction as part of the circular economy as its investment strategy with £25,000,000. 15 project examples include a reusable container centred grocery delivery service (Loop) and disposable paper bottles, wood chips packaging, seaweed sachets, recycled paper bags and others. It is also part of the world's largest seagrass restoration project - around the UK to overcome a 92% loss over the last 100 years. This will assist in a blue carbon offset scheme. Other financed support includes Nordsense -a full bin monitoring sensor, Eugene to detect the sustainability of European packaging, Naturbeads (avoid microbeads) and HD Wool.

8F Asset Management.

8F Asset Management focuses specifically on aquaculture. One project example includes Pure Salmon with a recirculating aquaculture system based technology and sustainable supply chain. An initial processing facility in Lesotho and \$250,000,000 investment is estimated to produce up to 20,000 tonnes, provide 250 full time jobs and revenues up to 8% of annual Lesotho GDP along with being powered by renewable hydroelectric electricity to minimise its emissions footprint impact. However, projects are still mostly in the inception stage. It has also invested in a 1000 ton salmon farm in Brunei in December 2019.

Ocean Finance

In contrast, Ocean Finance based in Greece, focus more on ports, shipping and marine renewable energy such as LNG. It focuses on blended financing from areas covering data, technology, risk management and forecasting, environmental sustainability, emerging fuels and others. It includes an Optimal Vessel Portfolio Synthesis to consider impacts. Specific project examples including carbon and shipping finance derivatives for Shanghai and Pudong China in 2010, LNG infrastructure in the East Mediterranean including Cyprus, MOS4MOS -a Monitoring and Operating Service for Motorways of the Sea and supporting maritime training innovations. It also devised the EUROPA Ship Plan and Europa Venture to ensure more eco-friendlier shipping across Europe. It follows Rockefeller Asset Management in therefore unusually seeking opportunities from increased government regulations including the aims of a reduction of CO₂ emissions by, 25%, NO_x emissions 85 to 90% and SO_x and Particulate Matter emissions by 100% for the 2020 IMO Sulphur Fuel Cap Regulations and EU 2012 Sulphur Directive. Examples include LNG provision, financing retrofitting

and scrubbers. From 2013-2015, the LNG infrastructure project was supported via €5,126,250 for Croatia, Cyprus, Greece, Italy and Slovenia. From 2015-2020 Cyprus, Greece and Italy benefitted from € 53,279,405 to complete the infrastructure and associated supply chain investment. It also supported the SPACETECH4SEA project using composite carbon fibre for a 86% weight reduction in the average LNG fuel tank. The investment worth €1,639,549 occurred from 2019-2021 with Greece and the USA. From 2018-2020 Cyprus gained a floating LNG facility worth 101,500,000 euros,

Asian Development Bank

The Asian Development Bank wishes to commit \$5 billion from 2019-2024 for its Plan for Healthy Oceans and Sustainable Blue Economies with a variety of blended and conventional finance including loans, credit and blue bonds. It indicated existing commitments of \$107,000,000 (54,000,000 from the Bank) for 4 atolls such as a \$13 million commitment to a desalination plant for Kiribati.

Conservation Finance Alliance

Conservation Finance focus on a variety of partnerships and project incubation accelerator, financing sources that have recently created a section specifically committed to marine and coastal finance, especially fisheries, aquaculture and marine protected areas. They are targeting research and eco-system centred approaches. In 2020 it received 75 project proposals from over 40 nations, but financed only 5 and mentoring to another 10. These projects include Investment in Coral Reef for Coastal Protection by Barbados Reef Keepers in the Caribbean and Trust Rubber Fund - Halcyon Agri Corp Ltd by the WWF-US. They also extend to an East African Community Reef and Forest Bank by Green-Fi Systems Limited, the “Kenyir For Life – Protecting the Kenyir Watershed through Sustainable Financing Mechanisms,” in Rimba Malaysia along with the US Biodiversity Lending Instruments for Coastal Restoration and Protection by Natrix Inc. Mentored projects include Conservation Capital’s Blue Buyout Fund in Africa, Chile’s Capital Azul project on coastal communities and biodiversity along with one on international tourism for the Ministry of the Environment. It includes the USA Possible Planet’s “Adapting PACE to finance conservation” and Carbon Yield Fund, an Egypt based diving boat sharing market site, and a Mexican ghost fishing gear recycling enterprise.

Conclusion

In conclusion, this source’s conceptual contribution was to map progress towards sustainable ocean finance and to strive towards uncertainty for those wishing to overcome one of the greatest barriers to solving the

global challenges facing the oceans -access to finance. If human beings wish to become a part of the blue economy future, we need to be able to utilise investments proactively to fuel innovation, ecosystem protection, enterprises and other solutions. Equally, investors are becoming more and more committed, seeing guidance. In response this source provided a partial identification, summary and analysis of blue economy developments, risks and challenges that provide a basis upon which funding and other forms of support can be channelled before. It also provides a brief update on identifying certain investors, their approaches and analysing trends to identify existing gaps, guidelines and inspirations including their competitors to ascertain the sincerity of existing efforts.

Of the 42 sources investigated 29 focused specifically on marine ecosystems, conservation, blue carbon and pollution reduction, 24 on marine protected areas and 24 on fisheries and aquaculture. 21 covered a variety of blue economy activities without being specific including desalination. 21 focused on marine technology and biotechnology, whilst only 14 focused on marine renewable energy, 1 on ports and shipping, 1 on maritime education/training and 1 on industry specifically. Only 3 focused on Africa specifically -and one solitary incubation hub and 1 for the Caribbean. None were found for Australia, the Middle East and Latin America specifically, 14 were more European focused, 11 more US focused and 9 were truly global focused

However, this research recognises the superficiality of analysis but recognises many firms have only started since 2017/2018 to prioritise this area, hence only a limited sample was provided. They thus often provide minimal information as to how successful their investments have been, thus undermining several of the 17 core UNEP Sustainable Finance Principles including Transparency (9), proving their impact (11) or contribution towards achieving Sustainable Development Goals (10) or a sufficient rate of return on investment for the most part. Many do not publicise the scientific evidence considered indispensable for the Precautionary Principle (12) or risk management (3) or identifying systemic risks (5). However, in spirit, the participants selected are gradually demonstrating at least a marketing and intention towards the other Blue Economy Principles including Productivity in preserving marine ecosystems (1), legal compliance (2), the need to be Adoptive for new opportunities as they emerge (4), incisive for local livelihoods and communities (6), consider economic, social and environmental values (7) and cooperate with other stakeholders (8). Several such as the World Bank, International Blue Carbon Initiative, Blue Natural Capital Financing Facility, Commonwealth Marine Economies Programme and Ocean Assets Institute are being especially committed to additional research and information being proactive (13). Others such as the Fishing Accelerator, Blue Bio

Value and Mermaid Investments focus on small and medium enterprises and initial entrepreneurs (14). When scaling up funds such as Althelia/Mirova become more committed. Many are committed to solutions to core problems and risks (15) and prepared to partner with others (16) including data sharing such as the Blue Prosperity Coalition.

Therefore, to finance a future blue economy vision and climate change age increasing attention needs to be devoted into converting over 115 UNEP Blue Economy stakeholder pledges and myriad other developments into tangible commitments of progress. Ultimately all ecosystems need preserving and extending, all species saving from the threats of climate change and extinction and every worthy innovation that can aid this transition needs to be financed, whilst other more destructive activities need to be halted and no longer subsidised or promoted by global finance. The circular economy also needs to prevail. As previously stated: A future vision is to fabricate an entire Census of African Marine Biodiversity encapsulating all species, a titanic database with information on all species, an African Marine Bioeconomy and Biotechnology Database of companies, projects, discoveries, patents and initiatives. It envisions far more marine ecological reserves and protected areas encompassing 60-75% of Earth's Exclusive Economic Zone and ultimately following the Chinese vision of 100% of species from aquaculture rather than wild fisheries, allowing the oceans to regenerate. It means ensuring a circular economy and eradicating bycatch waste, enhancing value adding and profits for individuals and communities.

It means celebrating the oceans through mass awareness campaigns to ocean eco-literacy, incentivising proactive behaviour in countering marine threats. It includes ensuring marine biotechnology hospitals, research cities, giant floating and underwater farms/aquaculture habitats and industry capable of resolving challenges in health, food security, climate change, sustainability, population, maritime waste and others. It includes algae powered fuel and power enlightening the way and a true African and global Renaissance for the future through the blue bioeconomy and technology. It extends to having local marine bioeconomy and finance stock exchanges, globally competitive corporations, ownership of patents, publications and marine genetic resources, the overcoming of finite scarce resources, threats of biodiversity loss and extinction via reserves, gene and biobanks, futureproofing against digital and climate change disruption. This research represents but a prototype in harnessing the latent potential of investing in the blue economy to our future. With it, we could create underwater and floating habitats, research centres and tourism facilities. We could extend our existences, cure many afflictions, ensure complete, productive food security for over 4 billion people; without impinging upon the waste of oceanic fisheries... We would dress in more durable, element

proof garments and utilise paper; our complexions would become more beautiful, enable more wondrous culture, art, materials and the survival of a great many species. We could preserve our maritime cultural heritage, reverse engineer coral bleaching, purge ocean acidification and cleanse the oceans and lagoons of marine plastic and other waste. We could transport via hovercraft, skimmers and submersibles and power via marine biorefineries and offshore renewable energy. With more effective means of resolving issues, we would not face waste greater than 130 million tonnes of by-products and catch each day worth over \$50 billion. Species could avoid marine biodiversity loss, collapsing ecosystems and ultimate extinction.