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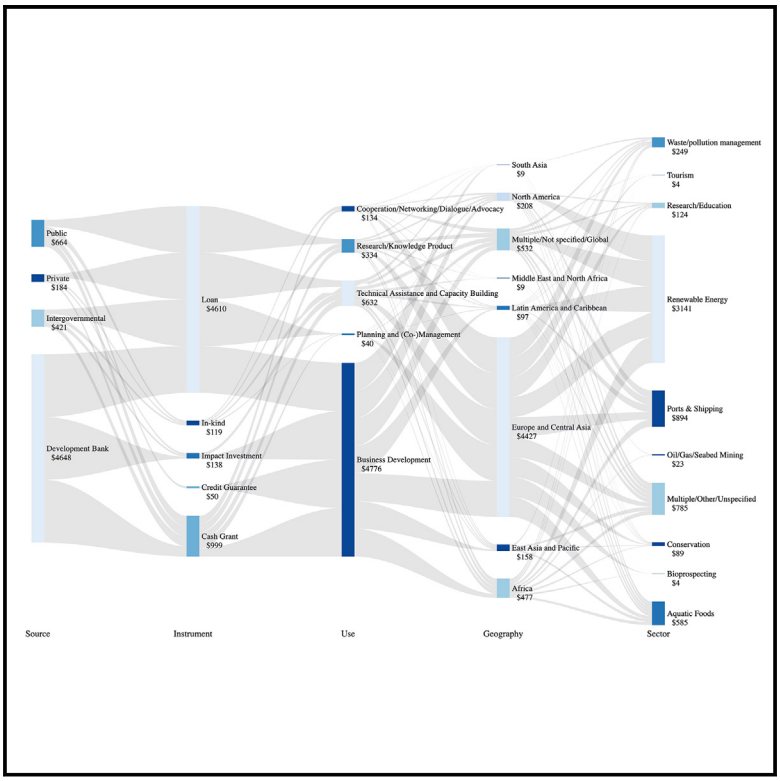
Mapping flows of blue economy finance: Ambitious narratives, opaque actions, and social equity risks

Graphical abstract



Highlights

- There is a lack of transparency of blue financial flows
- We establish a baseline database of blue economy money flows
- Flows are unevenly distributed and red flags for equity are widespread
- There is a disconnect between blue economy narratives and action

Authors

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In brief

Although the importance of adequate investment for achieving Sustainable Development Goals in the oceans has been championed, it is unclear what funding is currently available. We find that money flows in the blue economy are unevenly distributed across regions and industries, and potentially negative social equity impacts are prevalent. There is a disconnect between aims and actions in the blue economy, posing challenges for furthering economic development in the oceans that simultaneously promotes environmental sustainability and social equity.

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Mapping flows of blue economy finance: Ambitious narratives, opaque actions, and social equity risks

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SCIENCE FOR SOCIETY The blue economy is a concept guiding economic development in oceans, emphasizing environmental sustainability and social equity. Attention has grown to the "funding gap" between investment needed for achieving the Sustainable Development Goals (SDGs), on which the blue economy is based, and existing investment. However, it is unclear what money flows currently exist under the banner of the blue economy and whether they are an optimal use of public and private resources when pursuing sustainable development in oceans. We find that financing is skewed toward business development and offshore wind in Europe and Central Asia, with "red flags" for social equity in 35% of cases, showing that investment currently does not "leave no one behind" (the central promise of the SDGs). Our results provide a benchmark for investors, policymakers, and practitioners to critically examine what blue economy activities they fund or undertake and how they contribute to sustainability and equity goals.

SUMMARY

The blue economy provides a sustainability framework for ocean governance, but it is unclear whether narratives are matched by binding financial commitments and disbursements. Amid attention being paid to "funding gaps" in the Sustainable Development Goals, a lack of transparency in financial flows means that the blue economy concept risks being co-opted to facilitate further exploitation of ocean spaces and resources without contributing to environmental sustainability or social equity. Here, we analyze blue-economy-labeled money flows disbursed between 2017 and 2021 to identify sources and recipients and potential social equity impacts on the ground. Financing is predominantly disbursed to Europe and Central Asia and skewed toward business development and renewable energy. Our analysis reveals widespread occurrence of "red flags" for social equity outcomes. Although constrained to money flows that actively employ blue economy language, our findings show disconnects between finance and narratives of equity, inclusion, and sustainability. We offer a baseline for critical examination of blue finance flows in delivering equity and environmental sustainability.

INTRODUCTION

The blue economy has become a key concept in international discourse around ocean governance and increasingly plays a role in shaping stated policy goals at global to national levels.[1,2] From the perspective of intergovernmental institutions, the concept refers to the broad aim of efficiently tapping the economic potential of ocean spaces as well as improving social equity and environmental sustainability in the maritime economy, thus building on the concepts of sustainable development[3] and the "green economy."[4] The focus on normative goals of human and ecological well-being, as well as the integrated approach of governing across ocean industries, is what makes the blue economy distinct from the *ocean economy* in general, which is merely

accounting for all economic benefits derived from oceans.[2] Indeed, explicit attention to social equity has been identified as a key feature of a blue economy approach.[5,6]

The growing influence of the blue economy as a governance and development concept has attracted attention from a variety of actors across the international, national, and local scales due to its broad and flexible meaning, although this widening of the policy space also carries risks to achieving intended change.[7–9] Calls for a transformative approach to governing the blue economy can become buried under broad and diverging definitions of the concept; for instance, the United Nations Economic Commission for Africa (UNECA) and the African Union Commission use a very broad definition that "encompasses *all* activities developing or deriving from marine and aquatic ecosystems including oceans, coasts, seas, rivers, lakes and groundwater, and associated resources."[10] In contrast, environmental nongovernmental organizations (NGOs) tend to emphasize the protection of natural capital as a key feature of a blue economy.[11] Moreover, notable discrepancies exist between resource availability and governance conditions needed to equitably distribute costs and benefits from these resources, meaning that the potential for developing equitable and sustainable blue economies can fail to materialize even if natural resources are physically available.[12]

Recognizing that financing and investment can strongly shape development pathways, there is increased attention paid to "financing the blue economy," as exemplified by calls for closing the "funding gap" that exists between aims formulated in the Sustainable Development Goals (SDGs) and current levels of investment, including SDG 14, "life below water."[13] Calls for investment in the blue economy are often accompanied by explicit acknowledgment of the private sector as an important source of potential funding, for instance, in the form of impact investment (which, in addition to financial return, seeks social and/or environmental returns) and public-private partnerships.[14] "Blue finance" has been argued to be vital for the development of a sustainable ocean economy, through direct investment in sustainable activities and policies that can achieve a triple bottom line.[13] However, the extent to which market-based financing and investment will specifically include social and/or environmental returns is unclear, and even if they do, there is a risk that these considerations will become lost in a need to increase returns or minimize risks for investors.[15]

It is clear that this is a burgeoning time for ocean finance, with the group of actors involved in the "blue acceleration" of the ocean economy[16] never having been this diverse and complex, ranging from governments and intergovernmental organizations, to institutional investors and philanthropists,[17] to the World Economic Forum publishing its Ocean Finance Handbook.[14] However, it is unclear to what extent the blue economy—and indeed, which meaning of the term—is being invested in. Amid concern that the blue economy is drifting away from its original focus on equitable benefit sharing, and toward plain expansion of economic growth from the ocean economy,[8] there is a need to explore the types of money flows associated with the blue economy discourse. This is only a first, but important, step in improving transparency, coherence, and monitoring of ocean finance[18] and blue economy commitments.[19]

Here, we analyze the extent and focus areas of self-identified blue-economy-labeled funding and investment to examine the sectoral and geographic distribution of blue finance. Given the central role of social equity in blue economy discourse, we also analyze disbursements at a project level and identify potential "red flags" for social inequities. Building on a similar analysis for climate adaptation initiatives, we recognize that building blue economies comes with competing interests and trade-offs. We use a typology of enclosure, exclusion, encroachment, and entrenchment[20] to identify potentially inequitable outcomes of blue economy initiatives. We establish a baseline database comprising USD 5.9 billion of funding for blue economy-labeled finance and find that this financing is skewed toward funding for Europe and Central Asia, the renewable energy sector, and business development activities. Our results further indicate a mismatch between blue economy rhetoric, which emphasizes social equity, and a high potential for negative equity effects from blue economy projects that we find. More broadly, our results point to a continued need for scrutiny on financial resources allocated to the blue economy to ensure an equitable distribution of costs, benefits, and risks of blue economy projects.

RESULTS

Funders and types of funding provided

The search for blue-economy-labeled money flows resulted in a total of USD 5.9 billion in finance, made up of (in order of magnitude) loans, cash grants, in-kind contributions, impact investments, and credit guarantees (Figure 1). The overall picture of money flows is heavily influenced by loans from the European Investment Bank (EIB), which account for USD 3.1 billion out of a total of USD 4.6 billion provided by development banks overall. This role of the EIB is also reflected in the dominance of development banks as a source of funding, Europe and Central Asia as geographical focal points, and the use of the instrument type "loans" in the overall picture. In addition, since the majority of EIB investments went to the renewable energy sector (mostly offshore wind) and the rest of it went to ports and shipping, these sectors are also strongly represented.

The second largest funding source is public finance (USD 664 million), for instance, through the World Bank's PROBLUE program, which, according to the 2019, 2020, and 2021 annual reports, has disbursed USD 111.3 million (74.2% of the total amount of USD 150 million that has been committed by national governments under the PROBLUE program).[21] Beyond PROBLUE, the World Bank has over USD 9 billion in its overall oceans program that has not been labeled as blue economy (and is therefore not part of our analysis), including aquatic foods projects, coastal and marine management, waste management, tourism, transport, and offshore renewable energy.[21] Public actors also provided finance through regional initiatives, such as Promoting National Blue Economy Priorities through Marine Spatial Planning in the Caribbean Large Marine Ecosystem Plus (BE CLME+), and national and subnational projects like Canada's Ocean Supercluster and Washington State's Maritime Blue in the United States.

The next largest funding source is intergovernmental sources (USD 421 million), which contributed to, for instance, the Global

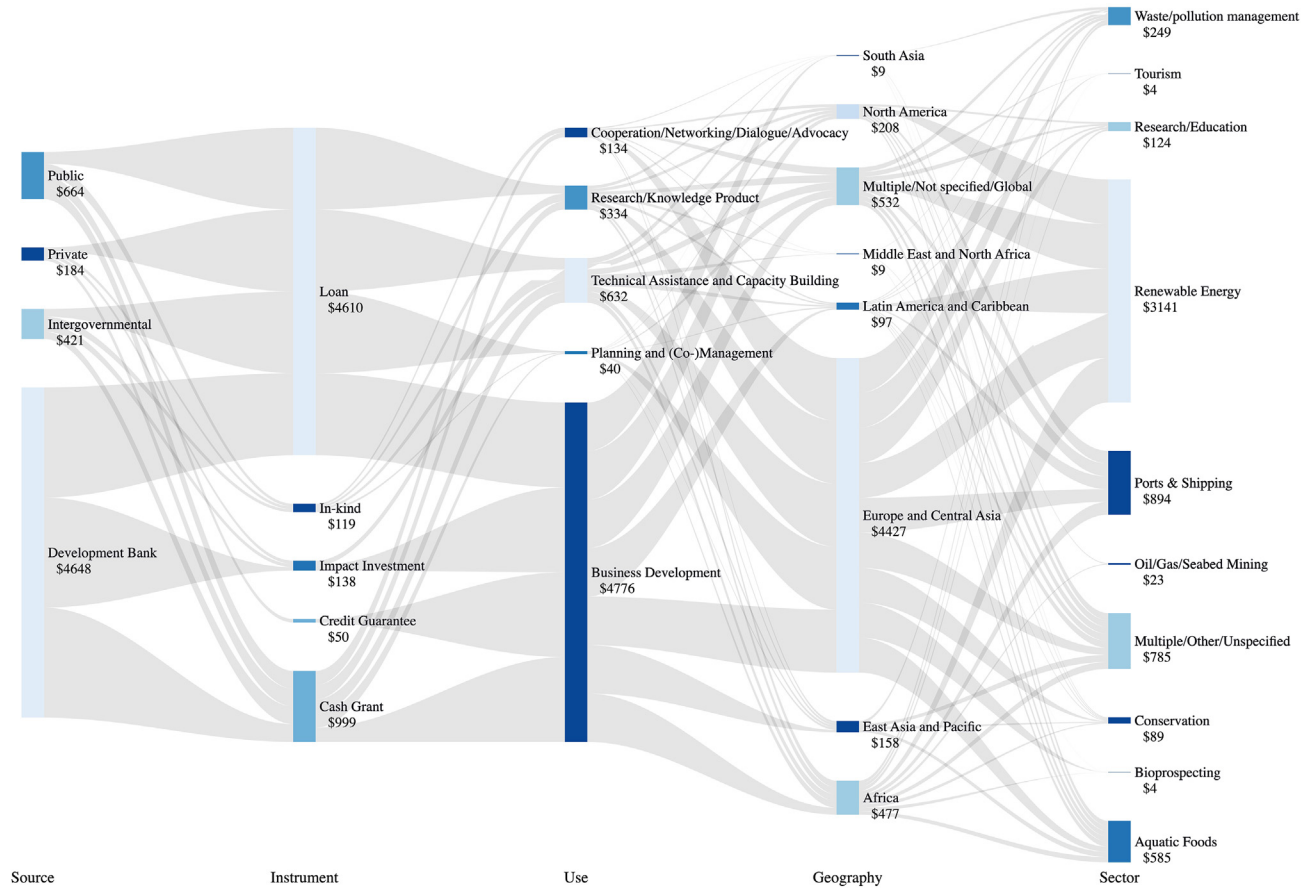

Figure 1. Blue-economy-labeled money flows (2017–2021) in millions of USD, according to type of funder, type of instrument, type of activity funded, geography, and sector/industry

Environment Facility (GEF) Small Grants Programme, the aforementioned regional Caribbean project, and also European Commission programs such as BlueInvest and NEPTUNE Blue Growth Accelerator. Finally, the private sector was the smallest source (USD 184 million), divided over projects such as the Sustainable Ocean Fund, Oceano Azul, the Canada Ocean Supercluster, and approximately 30 smaller individual projects.

Most public funding occurred in the form of cash grants (USD 544 million), followed by in-kind contributions (USD 59 million) and credit guarantees (USD 50 million). Intergovernmental money flows also mostly went to cash grants (USD 320 million), followed by USD 54 million in impact investments and USD 42 million in in-kind contributions, and finally USD 5 million in loans. Development banks, including the EIB, issued USD 4.6 billion in loans, USD 52 million in impact investments, and USD 17 million in cash grants. Finally, the private sector mostly contributed cash grants (USD 118 million), followed by USD 32 million in impact investments, USD 19 million in in-kind contributions, and USD 15 million in loans.

The activity that received the majority of the blue-economy-labeled funding was business development (USD 4.8 billion), which was mostly supported through loans. Other activities, such as technical assistance and capacity building (USD 632 million), research and knowledge products (USD 334 million), and cooperation, networking, and dialogue (USD 134 million), received notably lower levels of financial support from a varied set of sources (Figure 1).

The continent of Europe and Central Asia was the largest recipient of finance, with USD 4.4 billion (predominantly derived from the EIB), with Africa being the second largest recipient (USD 477 million). Most money flows in Europe and Central Asia went to renewable energy (mostly offshore wind) and ports and shipping. Within Africa, most money flows went to unspecified, multiple, or "other" industries, with the second largest recipient in terms of industries being waste and pollution management (USD 37 million) and the third largest industry being aquatic foods (USD 35 million).

Size of blue economy finance relative to industry size

The relative size of blue-economy-labeled finance as a proportion of industry size shows that there are large differences across the industries (Figure 2). Blue-economy-labeled money flows into renewable energy as a proportion of the estimated industry size are relatively high at 10.13%. The smallest relative amount of finance went to the oil and gas sector (less than 0.1%). Since oil and gas tend not to be identified among the sustainable and equitable blue economy industries,[5] it is likely

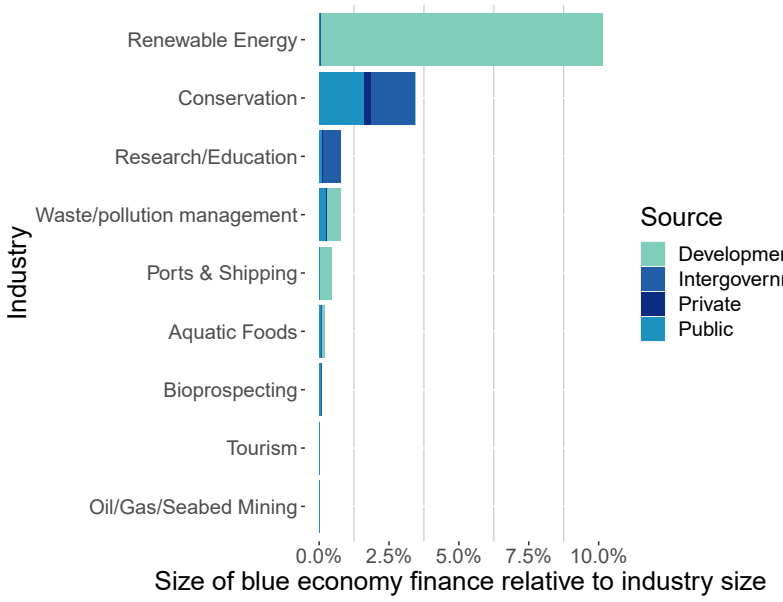

Figure 2. Blue-economy-labeled investment as a proportion of industry size (2017–2021)
Colors of bars indicate funding source (development bank, intergovernmental, private, public) (base year 2019).

that a smaller proportion of investment into this industry is explicitly labeled "blue economy" than the other sectors in our analysis. However, of the group of blue economy sectors included here, the oil and gas industry is also the biggest, with an estimated size of USD 847 billion, and blue-economy-labeled investment in this industry in absolute terms (USD 22.9 million) is still higher than two other blue economy industries in this analysis, namely tourism (USD 4.5 million) and bioprospecting (USD 3.9 million). Another industry with low relative investment is aquatic foods: with a total industry size estimated at USD 282 billion, blue-economy-labeled finance was USD 584.7 million, or 0.21%.

Social equity aspects of blue economy money flows

The rapid assessment of the presence of red flags for inequitable outcomes showed a total of 229 potential equity risks (of a total of 654 data points), divided over the categories of enclosure, exclusion, encroachment, and entrenchment (Figure 3). Most of the red flags (136) were related to enclosure, meaning that the project description indicated a risk of increased private control over previously public assets and decision-making processes. An example is support for private companies to grow in the blue economy space, thereby opening up space for private actors in areas of public good, which is how oceans are particularly perceived in communities with close ties to their environments.[22] One example of a project that potentially causes enclosure is Operation Phakisa in South Africa, which has been criticized for promoting private profit from, e.g., oil and gas extraction, while worsening public costs from climate change.[7] Another case of enclosure can be constituted by the creation of new bureaucracies on behalf of the project, as is the case with the Sustainable Ocean Fund, which has been established as a for-profit investment vehicle that raises and allocates funds.

The second most occurring red flag was entrenchment (111 cases), meaning that the project description indicated a risk of aggravating political, socioeconomic, or cultural inequalities and disempowerment of disadvantaged groups. This was the case when projects increased communities' reliance on value chains, for example, in the APOCEB project in Guinea Bissau, the Republic of Guinea, The Gambia, and Senegal. This project's description expresses the aim to strengthen value chains, including for mariculture and tourism, to improve economic, social, and environmental development. The World Bank's PROBLUE initiative has the potential to further cement reliance on international donors and thereby also presents a risk of entrenchment.

The third most occurring red flag was exclusion (75 cases), which occurred, for instance, in projects that aim to conserve coastal areas and restrict access for local communities. The APOCEB project mentioned above presents potential exclusion through its focus on protecting and restoring mangroves.

Finally, there were 23 cases of potential encroachment. Examples are a project of the government of Norway aiming to develop deep seabed resources in Africa, which might interfere with and degrade ecosystems, and projects that aim to promote new tourism.

Our quick scan of potential inequities identified in project descriptions revealed that the highest relative occurrence of red flags combined (enclosure, exclusion, encroachment, and entrenchment) was in Africa (Figure 3). This was the case both in absolute terms and relative to the number of projects: 70% of all project descriptions contained potential red flags. Other regions had far fewer projects and lower proportions of red flags for equity in their project descriptions: the database contained 21 projects in North America, 62% of which displayed a red flag (enclosure only); Europe and Central Asia had 53 individual projects, 51% with red flags (predominantly enclosure); Latin America and the Caribbean had 101 projects, with 41% red flags, mostly divided over enclosure and exclusion with a small portion of entrenchment and encroachment; the Middle East and North Africa had only 14 projects, of which 29% had red flags (enclosure and one case of entrenchment); East Asia and the Pacific accounted for 90 projects, 22% of which had red flags (predominantly enclosure, but also exclusion, encroachment, and entrenchment); and finally, South Asia had 23 projects, with 4 cases (17%) of possible enclosure.

DISCUSSION

Although the blue economy's financial needs and opportunities are increasingly receiving attention from governments, NGOs, and investors, actual financial commitments attached to blue economy narratives have largely remained unclear. This lack of clarity makes it difficult to assess to what extent blue economy aspirations are paired with the investment needed to realize

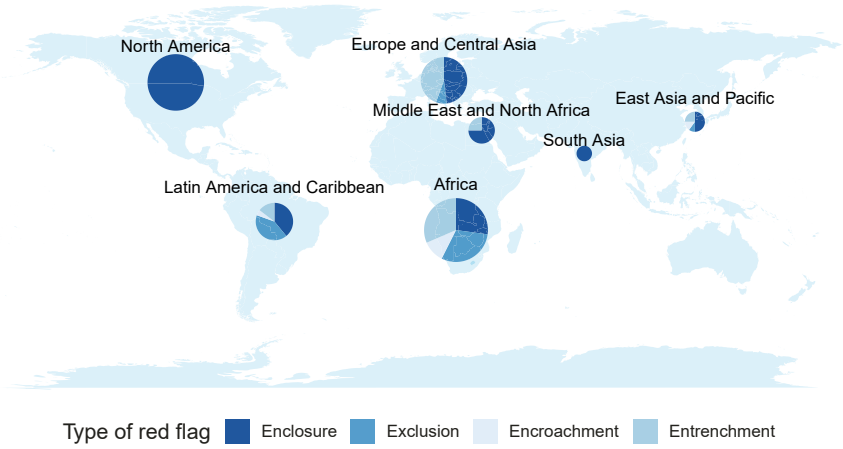

Figure 3. Relative occurrence of social equity risk in blue economy project descriptions

n = 104 for Africa, n = 13 for North America, n = 15 for Europe and Central Asia, n = 31 for Latin America and Caribbean, n = 4 for Middle East and North Africa, n = 14 for East Asia and Pacific, n = 4 for South Asia.

environmental sustainability and social equity. Therefore, we set out to explore who is investing, how much, and where in the blue economy to examine the extent to which investment under the blue economy banner is taking place, linking earlier studies of blue economy discourse, concern over inequitable distribution of benefits,[1,2,8] and calls for more insight into ocean finance and commitments.[18,19] Our analysis of the sectoral and geographic distribution of blue finance has identified difficulties in finding full information on blue economy money flows, a high level of investment into energy transition but not much into food systems transition, and considerable disparity in funding for Europe compared with the rest of the world.

Lack of transparency in blue-economy-labeled money flows

Our focus on flows that were specifically labeled "blue economy" has meant that only those funders, projects, and programs that employ the term were included in the analysis. This means that investments into the ocean economy more broadly were excluded. While this approach means that considerable flows of money in the ocean economy at large are missing from the database, it also means that we were able to compare and contrast use of the blue economy terminology with finance. Considering the specific discourse around the blue economy (and its focus on social equity), some actors may simply choose not to engage with the label and are, therefore, not part of this analysis. Not explicitly associating with the blue economy label could serve to keep at bay critical scrutiny that an enthusiastic embrace of the blue economy concept may invite.[23] In other cases, demarcating our boundaries to self-identified blue economy finance has excluded money flows that were not publicized online or did not use the English language. Our analysis is therefore necessarily constrained to only those financial flows that actively use the blue economy "branding" in English and that provided sufficient information on the project funded, so that there was at least information on the funder and the amount disbursed, supplemented with information on instrument, activity, geography, or industry (or all of these). The limitations and uncertainty in these data point to a transparency issue that must be addressed in public funding, as well as in private funding, to marine industries that overwhelmingly rely on public spaces and resources.

Indeed, a key finding of our analysis is that it has proven exceptionally difficult to obtain concrete information on blue-economy-labeled money flows. The challenge was exacerbated by different ways of reporting and information buried in appendices of reports. This difficulty in tracking blue economy investments highlights a lack of transparency on who is providing money, what it is used for, and in which geographies it is being spent. There is plenty of rhetoric on the blue economy and its funding, but there is often no concrete investment associated with the language. And when there is investment involved, it is difficult to pinpoint the specific purpose or use of the money, particularly when private funders/investors are involved. Public suppliers of funding tended to provide more detail, for instance, by making available databases of projects (e.g., through the OECD Creditor Reporting System[24]).

There are also other actors who do fund blue economy activities and projects but do not label these as such or who are positioned outside the mainstream blue economy discourse. This is the case with China: the Maritime Silk Road, as part of the Belt and Road Initiative, is positioned as an alternative development path not based on Western ideas, but its scale of investment and associated geopolitical power has been argued to be of major importance to global blue economy developments.[25] However, since our analysis has a focus on actors that self-identify their money flows as explicitly associated with blue economy discourse, investments into the Maritime Silk Road were not part of our data.

A disconnect between blue economy rhetoric and financial flows is also apparent when comparing our results with voluntary commitments made at recent high-level blue-economy-themed conferences. A study by Voyer et al.[19] of over 800 blue economy commitments identified a strong focus on capacity development and research and knowledge generation, two areas not strongly linked to financing in our study. In addition, business development was the least commonly referenced commitment theme, whereas our results indicate it as being the activity that was most generously financed. The strong focus on renewable (offshore wind) energy within the business development category can partially explain this discrepancy: due to high market concentration, firms in the offshore wind industry tend to be large and have high capital requirements.[26,27] Therefore, large loans to large-scale businesses and projects are likely to have skewed the picture. Finally, when commitments referenced a specific sector, it was most commonly fisheries (23%) or aquaculture (11%), while renewable energy was referenced in only 7% of total commitments. This contrasts considerably with the ways in which finance is flowing within the blue economy. Both the

commitments and the financing are consistent, however, in the predominant role of European actors, especially government and intergovernmental organizations.

Compared with global estimates of funding for ocean-related industries, blue-economy-labeled funding remains low. For instance, marine conservation, a prominent sector in blue economy discourse, has been estimated to receive USD 1 billion, consisting of official development assistance (ODA), grants, and subsidies, in the year 2015 alone (Berger et al., 2019). Another blue economy sector receiving a lot of attention in academic and policy arenas is the aquatic foods sector. Fisheries and aquaculture subsidies have been estimated to amount to USD 35.4 billion in 2018.[28] Both the conservation sector and the aquatic foods sector are receiving levels of support from blue economy finance that are only fractions of these overall numbers: our database contains money flows worth around USD 104 million for conservation (or 10.0% of total estimated funding), and those for aquatic foods are only 1.6% of total estimated subsidies (USD 542 million). Not only does the scale of investment not align with blue economy commitments,[19] it also confirms earlier findings that aquatic food systems are underrepresented and potentially outcompeted by other industries in blue economy discourse and policy.[29]

Geographical imbalances

The configuration of actors and investments is currently dominated by investments in renewable (offshore wind) energy in Europe and Central Asia. This geographical imbalance is a direct result of the large role of the EIB in disbursing blue-economy-labeled funding. The EIB states that it started engaging in wind energy in 2003.[30] Although we included only those projects that were explicitly categorized under blue economy, this "legacy" of engaging with a sector that later became part of the emerging blue economy concept may play a role in the EIB's adoption of blue economy language around their projects.

Looking beyond Europe, Africa emerges as the continent with the highest level of blue economy investment. This may be unsurprising when taking into account the prominent role of blue economy discourse, not only in individual African countries, but also within the African Union: the blue economy is a central part of the African Union's Agenda 2063 for inclusive growth and sustainable development.[31] Therefore, adoption of blue economy language fits in with wider development discourse in an African context.

Sectoral imbalances

The dominant role of the renewable energy industry can be ascribed to the large flux of blue economy money flows going to offshore wind energy projects in Europe. For a large part these investments are made in the form of loans under the EIB's Clean Oceans and the Blue Economy Programme.[30] Other major investments in renewable energy are made by EU institutions as well, such as the European Maritime and Fisheries Fund and under the NEPTUNE Blue Growth Accelerator. Clearly, the European Union has embraced the concept of the blue economy to further investment in renewable (offshore wind) energy. The EIB itself has stated that wind energy has always been a central feature of its lending operations and positions itself as central to enabling emerging technologies that might be too risky for the private sector.[30] By labeling existing activities as "blue economy," the EIB could enter the world of blue economy discourse with tangible investments already in place.

Although the aquatic foods industry is the third largest recipient of blue economy money flows, with finance flowing to a more varied group of continents, relative investment is categorically low, with 0.19%, and only bioprospecting, tourism, and oil and gas receive lower relative levels of blue economy investment. Whereas oil and gas are considered problematic industries within blue economies,[2] tourism and aquatic foods have the potential to be environmentally sustainable and socially equitable.[32,33] The lack of investment in aquatic foods is particularly concerning, given the vital role that aquatic food systems play in providing nutritious food to people who are lacking key nutrients, the contributions of these systems to livelihoods and sustainability, and the expected challenges for food production under climate change.[34–36] Our analysis shows that this underrepresentation appears to translate into lower absolute and relative investment in a blue economy context. Blue-economy-labeled money is flowing toward the energy transition, but not so much toward the food systems transition that is needed to provide food, nutrition, and livelihoods to the people that rely on these systems.[37,38]

Social equity implications of blue economy projects

While an in-depth analysis of equity outcomes of individual blue economy projects was outside the scope of this article, our quick scan of red flags in project descriptions in the database revealed a risk of enclosure, exclusion, encroachment, and/or entrenchment in 35% of the cases, with enclosure as the most common equity risk. If staying close to the original blue economy aspirations (placing social equity at the forefront of ocean-based development) remains a key ambition, financial flows in the name of the blue economy deserve more scrutiny on their equity implications on the ground. Even if, in practice, red flags do not materialize, and despite our analysis being based on sometimes very brief descriptions, the presence of red flags alone points to a lack of foregrounding equity outcomes. The predominant form of adverse equity outcomes that our analysis found was enclosure, which refers to an increase in private control over public resources and decision-making.[20] This outcome aligns with a previously identified risk of blue economy initiatives looking for investment opportunities, where oceanic spaces that are generally considered public goods are being enclosed through private ownership, leading to clashes with legal regimes and cultural connections with the sea.[22]

More in-depth case studies can help reveal why the occurrence of red flags seems relatively high for projects in Africa and how processes of enclosure, exclusion, encroachment, and/or entrenchment are felt by local communities, as well as how they are perceived by investors and other project stakeholders. More specifically, efforts are needed to articulate the conditions under which private investment in common goods (physical ocean space, marine genetic resources) provides equitable benefits and a just distribution of associated costs.

In addition to project-level examples of negative effects on social equity, broader debates are taking place on the fairness of financing development in the Global South using debt

instruments. These discussions are about the morality of placing further pressure on already highly indebted countries to deal with issues that they did not cause, particularly in the case of climate change adaptation and mitigation, and point to a disregard of climate justice in favor of creating debt instruments that privilege returns for investors and entrench power imbalances between the Global North and the Global South.[39–41] Similar arguments have been made for the blue economy and its associated (innovative) financial instruments, pointing to the risk of these instruments reproducing exploitative relations and expanding these into the oceans.[42,43]

Toward transparency, accountability, and monitoring

The blue economy concept proposes effective governance as a way to achieve triple-bottom-line outcomes and reduce conflict,[1,5,44] but our analysis, and particularly the difficulty of obtaining records on blue-economy-labeled money flows, has shown that key elements (transparency and accountability) are lacking. The difficulty in tracing blue economy money flows shows that a clearer view is needed on who is investing in the blue economy, how much, and where, both geographically and sectorally, because transparent ocean governance should include transparency on flows of finance. Until then, enthusiasm surrounding the blue economy risks, at worst, supporting or stimulating continued or even accelerated inequitable and unsustainable exploitation of oceans or, at best, invisible contributions to the bold aims and goals of the concept.

Our results suggest a need to manage expectations regarding the role of private sector investment into the blue economy. Although impact investment garners a lot of interest and attention, our findings show that the majority of finance in the impact investment sphere comes from either intergovernmental (EU) or development bank sources, with only a minority of the Sustainable Ocean Fund coming from private sources. It must be noted, however, that these findings are also likely an artifact of the less accessible and less public information shared by private investors, whereas public suppliers of funding are more open, and perhaps more accountable, about what they finance and how.

There are signs that some of the concerns raised by academics and practitioners in the field of blue economy governance are indeed starting to be addressed. For instance, the first round of impact investment administered through BlueInvest (an investment pipeline initiated by the European Commission) appears to address both the relative lack of investment in aquatic foods and the relative lack of private sector engagement. The first round of funding calls from BlueInvest focuses on food security and explicitly seeks to connect with the private sector as a source of investment.[45] Although this project is too recent to fall within the scope of our analysis, as concrete projects are yet to be announced, these investments in the aquatic foods sector appear cognizant of emerging narratives and goals around food and nutrition as vital parts of any blue economy.

Given the prominence of stated interest in sustainability and, in particular, equity in the blue economy,[6] it is striking that much of the money that accompanies the discourse is flowing in the form of loans rather than cash grants. The dominance of loans as instruments of blue economy finance indicates a preference for money flows toward where they can best be repaid. Our analysis provides a starting point for further research into the actual impact of blue finance on the ground, building on the rapid assessment of equity risks in project descriptions. Although following through on individual projects is beyond the scope of this study, it will be vital for improved transparency and accountability in the blue economy to do so in future research. This next phase of research can consist of case studies that include a representative range of perspectives from resource users, civil society, policymakers, industry representatives, and other stakeholders to critically examine whether blue-economy-labeled money flows are reaching those who need it most. Indeed, it has been argued that the ultimate beneficiaries from "blue" impact funds will be private sector developers and that, where direct users do benefit, environmental sustainability might be neglected.[46] Moreover, South Africa's prominent blue economy project—Operation Phakisa—has been found to promote investments that favor extractivism and uneven development, thereby putting further pressure on already vulnerable ecosystems and the climate.[7] These examples show that there is a need to critically evaluate current and future blue finance flows for their effectiveness in delivering equity and sustainability improvements, for instance, through mapping the distribution of costs and benefits (economic, social, and environmental) from the project, involvement of stakeholders in decision-making, and recognition of their needs and rights.

Conclusion

Our analysis of money flows in the blue economy space has revealed imbalances in terms of funding sources, industries, and geographies. In addition, the difficulty of tracking detailed financial information accompanying blue economy discourse illustrates a need for more transparency and accountability. This accountability becomes particularly important as emergent blue economy projects move into their next phase, where outcomes of projects will have to be monitored to examine whether they have reached their intended outcomes and if they have an impact on other users of ocean spaces and resources. Our quick scan of social equity risks indicates that scrutiny is warranted for the distribution of costs, benefits, and risks, including loss of access to physical and decision-making spaces for stakeholders. Whereas in our analysis the blue economy label was self-identified by projects and funders, the next phase of this type of research could do more to examine what qualifies as proper blue economy initiatives, based on calls for placing social equity front and center of any blue economy initiative. The promises of the blue economy can be realized only through effective, transparent, and accountable governance and finance. Without it, there is a risk of co-optation of the concept that wastes scarce funding resources and facilitates continued, and potentially accelerated, exploitation of ocean spaces, without contributing to environmental sustainability or social equity.

EXPERIMENTAL PROCEDURES

Resource availability

Lead contact

Further information and requests for resources should be directed to and will be fulfilled by the lead contact, Marleen Schutter (m.schutter@cgiar.org).

Table 1. Sources used for finding publicly available information on blue economy money flows

Source name	Web address/subsection
Funding the ocean	fundingtheocean.org.
CMLE+	clmeplus.org
European Commission Blue Economy website	EMFF data hub: https://emff.easme-web.eu/
OECD CRS System	ODA disbursements: https://stats.oecd.org/DownloadFiles.aspx?DatasetCode=CRS1
ADB database	https://www.adb.org/projects?terms=
Sustainable Ocean Fund	mirova.com/en/funds/unlisted/3766/althelia-sustainable-ocean-fund
GEF Small Grants database	https://sgp.undp.org/spacial-itemid-projects-landing-page/
Canada Ocean SuperCluster	https://oceansupercluster.ca/wp-content/uploads/2021/05/OSC-Infographic-Overview-and-Project-List-May-2021.pdf
PROBLUE Annual Reports	https://www.worldbank.org/en/programs/problue/knowledge-and-resources

Materials availability

This work did not generate novel materials.

Data and code availability

The datasets and code generated for and used in this studyhttps://github.com/MSchutter29/Blue-Finance have been deposited to GitHub: [DOI: 10.5281/zenodo.10793920]

Web search

We did a broad web search and searched in available blue finance databases (Table 1) to capture money flows that were paired with the term "blue economy." Since a large variety of actors use the term, with varying definitions,[2] for the purpose of this paper we decided not to impose any particular definition of what constitutes *the* blue economy and based our search on money flows that self-identified as such. It was necessary to set boundaries for establishing a database, which is why we did not extend our search to investments that under the various definitions could be said to be a part of the blue economy, but that did not label themselves as such, and instead used labels such as the SDGs or climate or conservation terms. Although this undoubtedly makes the picture incomplete, it also allows for a clearer view of what projects and which funders choose to actively engage with blue economy narratives and discourse specifically (and make publicly available the details of their financial contributions), rather than engaging in the ocean economy more broadly. As a result, rather than claiming to present definitive and precise numbers, this study is intended to offer insight into general trends and flows of blue-economy-labeled finance between funders, instruments, activities, geographies, and industries. We then compared levels of blue economy investment per industry as a proportion of industry size and analyzed individual projects for red flags of enclosure, exclusion, encroachment, and entrenchment, which would indicate potentially inequitable outcomes.

Initial search and mapping money flows

Casting our net as wide as possible, we started with a web search that used the keywords "Blue economy" AND Fund* (to capture "funding," "funds," etc.) OR Grant* OR Financ* (to capture "financing," "finance," etc.). In addition, we used databases of philanthropic ocean funding (e.g., fundingtheocean.org; website and database now retired) and the voluntary commitments database made under three noteworthy ocean conferences that had the blue economy as an important theme: Our Ocean, the UN Ocean Conference, and the Nairobi Sustainable Blue Economy Conference.[19] Other databases that we used include the Asian Development Bank (ADB) projects

Box 1. Glossary

Funder: what kind of organization has disbursed the funding?	
Public	units of government (national/state government, local governments)
Private	organization of private persons or commercial company
Intergovernmental	entity consisting of two or more nation states
Development bank	non-commercial financial institution providing capital for economic development
Instrument: how is the funding disbursed?	
Loan	repayable, interest-bearing amount of money
In-kind	contribution in the form of goods and services as opposed to money
Impact investment	investment seeking financial return as well as social and/or environmental benefits
Credit guarantee	agreement that guarantees a debt will be repaid to a lender by another party if the borrower defaults
Cash grant	a money flow given to an organization or individual for a particular purpose
Use: what activity is the funding used for?	
Cooperation/networking/dialogue/advocacy	activities that bring together various actors or raise awareness; examples include conferences, campaigns, and bi- or multilateral meetings
Research/knowledge product	activities that generate knowledge; examples include research projects and reports
Technical assistance and capacity building	activities that provide practical support to individuals or organizations; examples include training courses and assistance with monitoring
Planning and (co-)management	activities that support and guide government and/or community-based management
Business development	activities that develop and implement growth opportunities for new or existing businesses

Table 2. Categories used for classifying each flow of money disbursed under blue economy programs

Category	Description	Comprising
Type of funder	who is supplying the money?	development bank, intergovernmental organization, public (ODA, bilateral, fiscal allocations), private (for profit, e.g., investment management, and not for profit, e.g., philanthropy)
Type of instrument	what channel is used?	cash grant, credit guarantee, impact investment, in-kind, loan
Type of activity	what is done with the money?	business development, cooperation/networking/dialogue/advocacy, research/knowledge product, planning and (co-)management, technical assistance and capacity building
Geography	where is the money deployed?	Africa, East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, North America, South Asia, multiple/unspecified/global
Sector or industry	what is the main beneficiary?	aquatic foods, bioprospecting, conservation, oil/gas/seabed mining, ports and shipping, renewable energy, research/education, tourism, waste/pollution management, multiple/other/unspecified

database[47] and the GEF database on their Small Grants Programme[48] as well as the GEF's larger portfolio on International Waters and Biodiversity. Finally, we included funding that occurred under ODA and that was labeled with "blue economy" in the OECD Creditor Reporting System.[24] We further used a snowballing technique to identify other sources of funding, for instance, additional projects by funders identified in our original source or projects referenced by these funders. Since we were interested only in finance that self-identified as being related to the blue economy, we continued to include only money flows that made explicit mention of the concept. To create a current accounting of ocean finance, we included money flows that occurred across the years 2017–2021, with 2021 being the most recent year with complete ODA data and disbursement information available and 2017 representing the year of the first UN Ocean Conference. For projects taking place over multiple years, we prorated disbursements. Where amounts were listed in currencies other than USD (e.g., AUD, EUR), we used the historical 10-year average exchange rate available on OFX (ofx.com).

Data were organized into a database that classified each money flow according to (1) its type of funder, (2) the type of instrument used, (3) the type of activity funded, (4) the geography in which the funding was deployed, and (5) the sector or industry that received the funding (Box 1; Table 2). We classified money flows according to apparent or specified priority areas, and for projects, we identified individual sources of funding to assign specific flows to specific types of funders. For example, many different actors provided funding for the Sustainable Ocean Fund, and rather than lumping these together, we assessed which component of the project was funded by which type of actor.

Not all funders and projects are very specific about the type of projects they fund, the instruments they use, the activities that are undertaken, or the main sector that they contribute to. For instance, while some funders distinguish between fisheries projects and aquaculture projects, many do not. Therefore, we included both fisheries and aquaculture under the aquatic foods sector. Where other characteristics of a money flow were unclear, we used triangulation with other sources (e.g., publicly available information on the internet or direct inquiries to funders) to classify these flows. Ultimately, if we were unable to specify any of the categories for a money flow, including the precise amount, this flow was not included in our database and subsequent visualization. We mapped the flows of money in our database between types of funders, instruments, activities, geographies, and industries in a "Sankey diagram," a type of chart that is frequently used to map flows and their interdependencies.[49] We used the freely available Charticulator tool by Microsoft (charticulator.com) for mapping our Sankey diagram.

Relative size of investment

In addition to mapping the flows of money, we also calculated the relative size of blue-economy-labeled investment to the size of each industry to compare relative investment between these industries and provide insight into where the so-called "funding gaps" might be. We used publicly available data on industry size, from a variety of sources (Table 3). We used the year 2019 as a reference point and adjusted figures on industry size using the Consumer Price Index (https://data.bls.gov/cgi-bin/cpicalc.pl).

Table 3. Sources and estimates of industry sizes

Industry name	Size (10^9 $)	Source	Notes
Aquatic foods	282	Virdin et al.[50]	conservative estimate, excluding inland fisheries and aquaculture
Bioprospecting	4	Energias Market Research[51]	using projected compound annual growth rate of 9.61% (base: USD 3.5 billion [2017])
Conservation	3	Our Shared Seas[52]	excluding government expenditures (blue economy money flows adjusted accordingly)
Oil/gas/seabed mining	847	Virdin et al.,[50] BCC Publishing[53]	combined data on offshore oil/gas with seabed mining
Ports and shipping	198	Virdin et al.,[50] A. Partners[54]	combined data on port activities (using largest port operator companies as proxy) and shipping sector
Renewable energy	31	Markets and Markets[55]	offshore wind only, estimated at USD 31.8 billion in 2021
Research/education	16	Jolly et al [56]	rough estimate; for USA includes ocean science and other ocean and coastal government programs
Coastal and marine tourism	57	QY Research Group[57]	cruise industry plus coastal and marine tourism industry
Waste/pollution management	33	Fortune Business Insights[58]	global plastic waste management only

Industry sizes in USD billions, inflation adjusted to 2019 prices using the Consumer Price Index (https://data.bls.gov/cgi-bin/cpicalc.pl).

Table 4. Processes that can lead to inequitable outcomes in blue economy projects

Red flag	Description	Examples in blue economy space
Enclosure	"The process that transfers a public asset into private hands, or extends the role of a private actor into the public sphere."	private institutions trying to expand into new and potentially profitable activities as a result of a blue economy project projects that create their own bureaucracy, which increases autonomy or sovereignty for private actors (e.g., NGOs or other private actors that by providing technical assistance gain decision-making power in public governance)
Exclusion	"Processes that limit access to resources or marginalize a particular group of stakeholders in the decision-making process. Exclusion amounts to a strategy of containment, a way to prevent other parties from interfering with one's interests so that actor can dominate others with their agenda."	lack of meaningful and deliberative decision-making, e.g., in the designation of Marine Protected Areas or in processes of Marine Spatial Planning privatization of ocean-front property that leads to a loss of physical access as well as a loss of access to decision-making processes around coastal areas
Encroachment	"Encroachment occurs when projects intrude or infringe upon protected areas, national parks, and wildlife reserves, or interfere with the healthy functioning of an ecosystem."	extractive industries that disturb offshore ecosystems and lead to greenhouse gas emissions; coastal development, e.g., tourism, in marine parks and reserves silt from reclaimed land covering and adversely affecting the health of coral reef habitats that small-scale fishers rely on for their reef fish catches, seawalls leading to coastal erosion elsewhere, mangroves lost due to industrial aquaculture
Entrenchment	"The process by which a project aggravates political, socio-economic, or cultural inequalities and the disempowerment of disadvantaged groups."	intensifying inequities by favoring concentration of wealth within a community or by hurting vulnerable members of a community, such as artisanal fishers, indigenous groups, or ethnic minorities; this can happen through, e.g., tradeable quota systems, promotion of debt instruments for purchasing bigger boats, or increased reliance on international value chains through an emphasis on trade

Descriptions based on Sovacool et al.,[20] pp. 616–617.

Social equity implications of blue economy money flows

Finally, to gain insight into likely social equity outcomes of individual projects and disbursements, we conducted a rapid assessment for each individual money flow of potential red flags that might lead to inequitable outcomes. Due to the size of the database, this assessment was based on project descriptions only and therefore expressly serves as an initial exploration of what implementation of blue economy projects might look like on the ground. The initial coding was done by a research assistant, with two other authors sense-checking the findings. We analyzed project descriptions for potential issues based on a typology of enclosure, exclusion, encroachment, and entrenchment, which is based on earlier work mapping unintended consequences of climate adaptation projects (Table 4).[20] Enclosure refers to processes that transfer public assets into private hands or extend the role of private actors into the public sphere, exclusion refers to processes that limit access to resources or marginalize stakeholders in decision-making processes, encroachment refers to processes that intrude or infringe upon ecosystems and protected areas, and entrenchment refers to processes that aggravate inequalities and disempowerment of disadvantaged groups.

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AUTHOR CONTRIBUTIONS

Conceptualization, M.S.S., A.C.-M., M.V., E.H.A., D.B., and E.Y.M.; methodology, M.S.S., A.C.-M., and E.H.A.; investigation, M.S.S., M.V., and C.D.-W.; writing – original draft, M.S.S.; writing – review & editing, M.S.S., A.C.-M., M.V., E.H.A., D.B., and E.Y.M.

DECLARATION OF INTERESTS

The authors declare no competing interests.

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