

Changes in Marine Ecosystems in the Tohoku Coastal Region and the Future of Fisheries

–How the lessons learned from the great east Japan Earthquake affects the future of the Tohoku Coastal Region–



海洋政策研究所



Supporting Sustainable Ocean Development with Blue Finance

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海洋政策研究所



- Take a comprehensive view on a wide range of ocean-related issues, analyzing challenges through a scientific approach that integrates the natural and social sciences as well as the humanities.
- Propose feasible strategies to serve as reference for policymakers in the international community and strive to engender an environment conducive to making these policies a reality.
- Use policy research approaches to assist in resolving the myriad marine challenges we face and help establish a new ocean governance so that we may ensure future generations can enjoy healthy waters for years to come.

Being a premier Ocean **Think, Do, and Innovate Tank**, OPRI will gather, analyze accurate ocean info from local research. Protect Earth's life, create value. Through shared info, dialogue, education among nations, ethnicities, regions, diverse people, aim to make the ocean a hub for peace, prosperity.



Ocean Policy



Islands and their Surrounding Ocean Areas



Sustainability



Research and Investigation on Ocean Resource



Ocean Education and Capacity Building



Arctic Ocean



Maritime Security


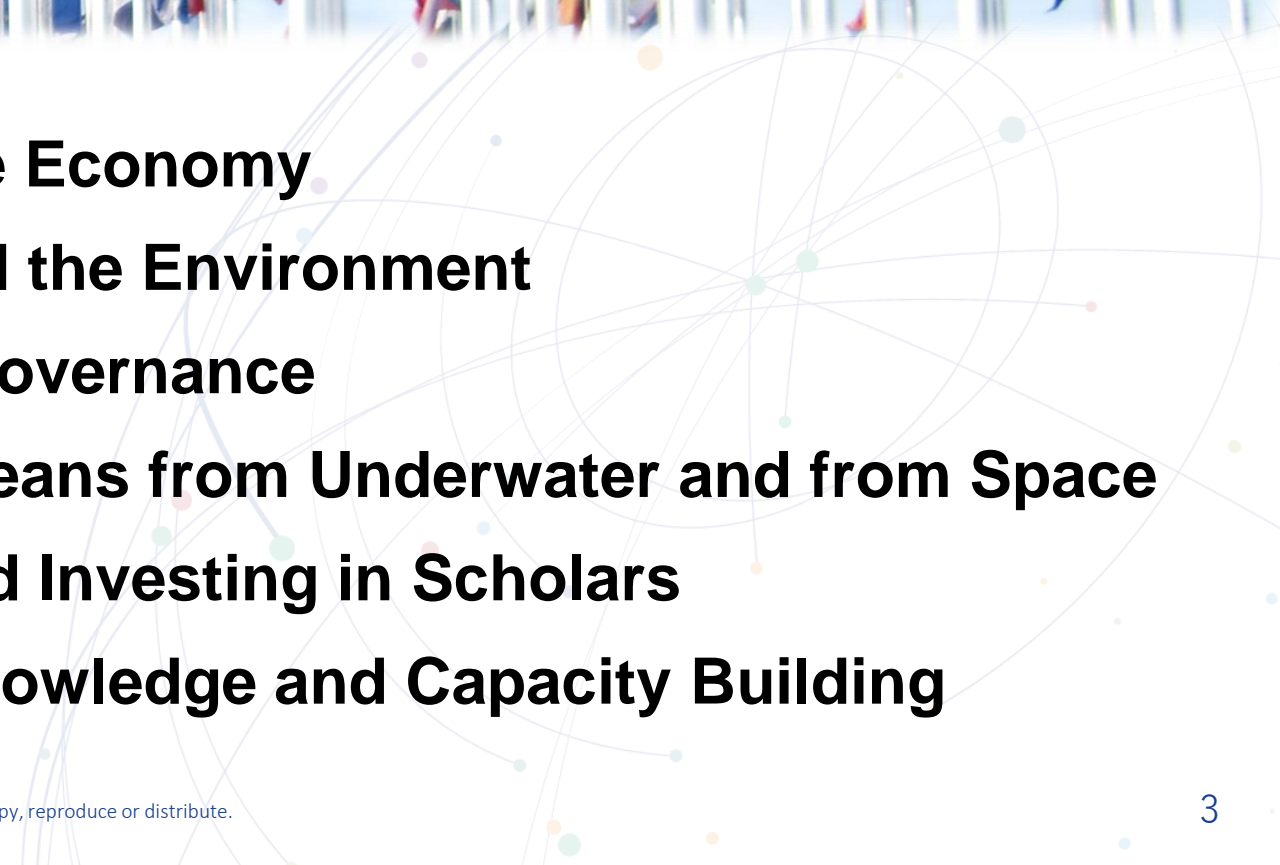


Marine Environmental Protection



Information Dissemination about the Ocean

OPRI's Six Aims

- 
- 
- **The Blue Economy**
 - **The Oceans and the Environment**
 - **Ocean Governance**
 - **Ocean Science—Illuminating the Oceans from Underwater and from Space**
 - **Ocean Education and Investing in Scholars**
 - **Sharing the Depths of Our Knowledge and Capacity Building**

■ Ocean Transformation (OX)

■ Blue Economy

- ✓ Tsunami Disaster Impact Assessment
- ✓ Blue Carbon
- ✓ Publications

■ Blue Finance

- ✓ Background
- ✓ Category

■ Blue Impact Finance

- ✓ Indicators
- ✓ Potential fields

■ Blue Finance for Sustainable Ocean Development

The image features a background of a blue ocean with sunlight reflecting off the water's surface, creating a shimmering effect. The text is centered in a white horizontal band.

Ocean Transformation (OX)

Recognizing the need for a significant overhaul in ocean policy:

Time to advance Ocean Transformation (OX)

- Enhancing maritime security, fostering new industries, advancing existing ones, developing environmental tech, and actively contributing to international SDG efforts to achieve effective solutions.
 - ✓ Respond to situations of Japan's surrounding waters.
 - ✓ Address climate change and natural disasters.
 - ✓ Enhance international competitiveness.
 - ✓ Develop and secure maritime human resources.

The 4th Basic Plan on Ocean Policy (Approved in Cabinet Meeting on 2023/4/28)

- Comprehensive maritime security and establishing sustainable oceans -

I. Comprehensive Maritime Security

- ✓ Maritime Security
- ✓ Policies contributing to enhancing maritime security

II. Building Sustainable Oceans

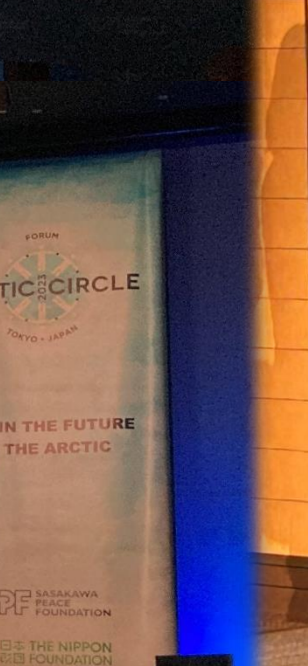
- ✓ Contribution to achieving carbon neutrality
- ✓ Conservation, regeneration, and maintenance of the marine environment
- ✓ Effective fisheries resource management
- ✓ Enhanced and utilized foundational knowledge for initiatives

III. Key Initiatives to Be Steadily Promoted

- ✓ Promotion of marine industrial utilization
- ✓ Enhancement of scientific knowledge
- ✓ Advancement of DX in the maritime sector
- ✓ Advancement of Arctic policies
- ✓ International cooperation and collaboration
- ✓ Developing and securing maritime talent while increasing public understanding
- ✓ Measures against infectious diseases



Arctic Circle Forum being firstly held in Japan in 2023



Blue Economy



BLUE ECONOMY

The Blue Economy is sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health.

The Blue Economy encompasses many activities...

RENEWABLE ENERGY

Sustainable marine energy can play a vital role in social and economic development.

FISHERIES

Marine fisheries contribute more than **US\$270 billion** annually to global GDP. More sustainable fisheries can generate more revenue, more fish and help restore fish stocks.

MARITIME TRANSPORT

Over **80%** of international goods traded are transported by sea, and the volume of seaborne trade is expected to double by 2030 and quadruple by 2050.

TOURISM

Ocean and coastal tourism can bring jobs and economic growth. Coastal Least Developed Countries and Small Island Developing States receive more than **41 million visitors** per year.

CLIMATE CHANGE

The impacts of climate change on oceans—rising sea-levels, coastal erosion, changing ocean current patterns, and acidification—are staggering. At the same time, **oceans are an important carbon sink** and help mitigate climate change.

WASTE MANAGEMENT

80% of litter in the ocean is from land-based sources. Better waste management on land can help oceans recover.

Ocean Economy v.s. Blue Economy

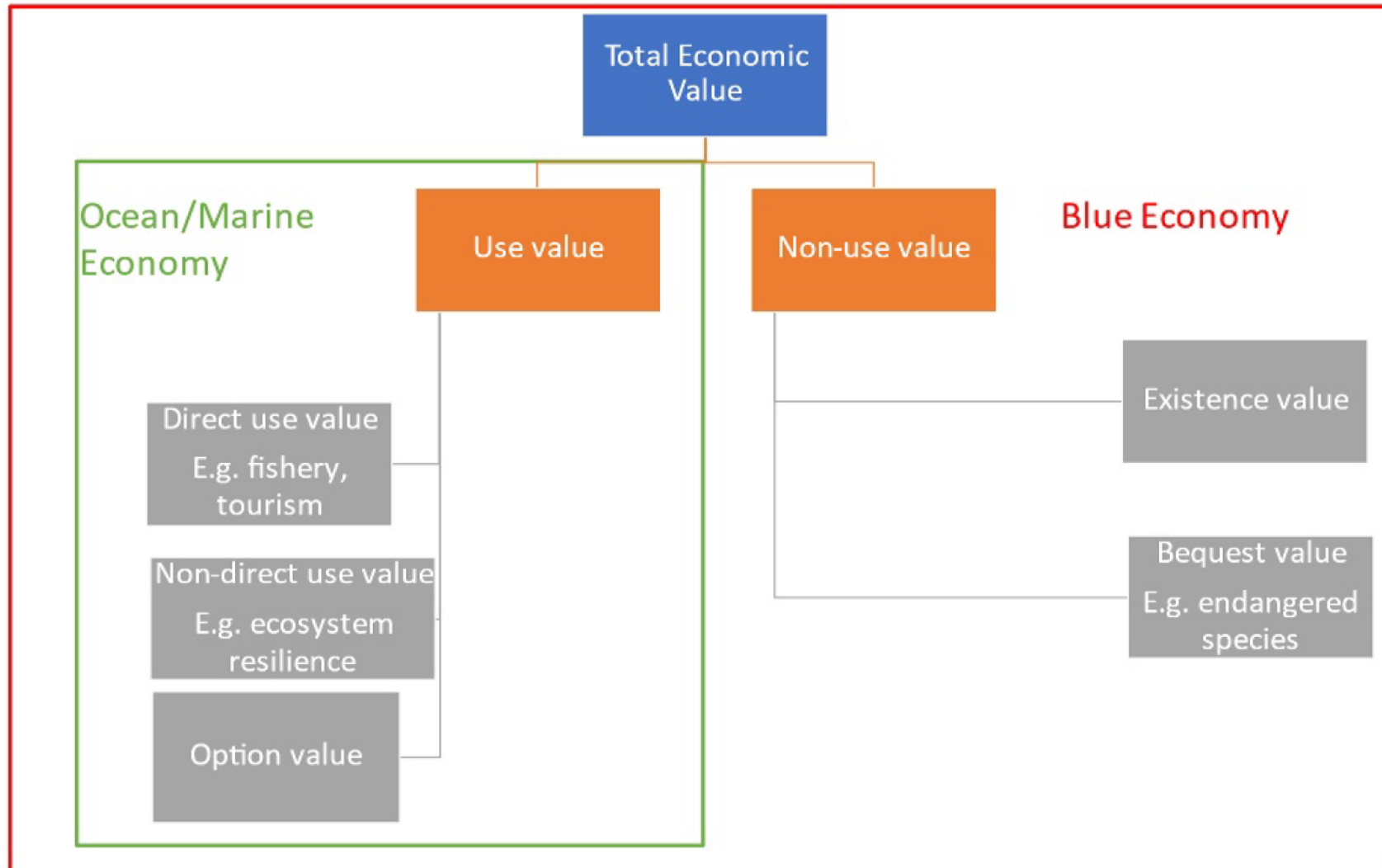
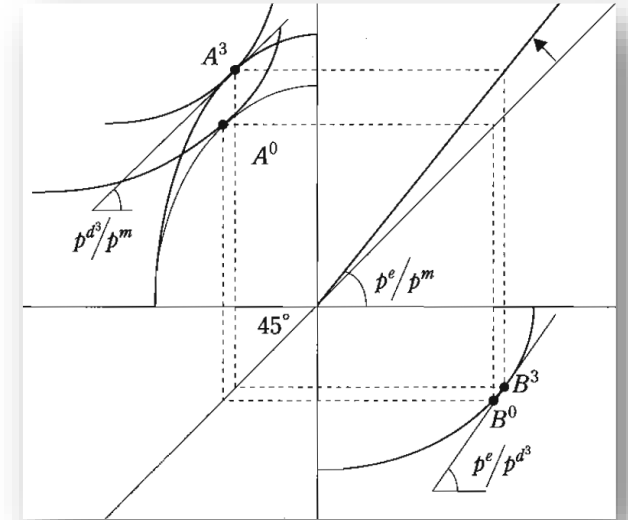
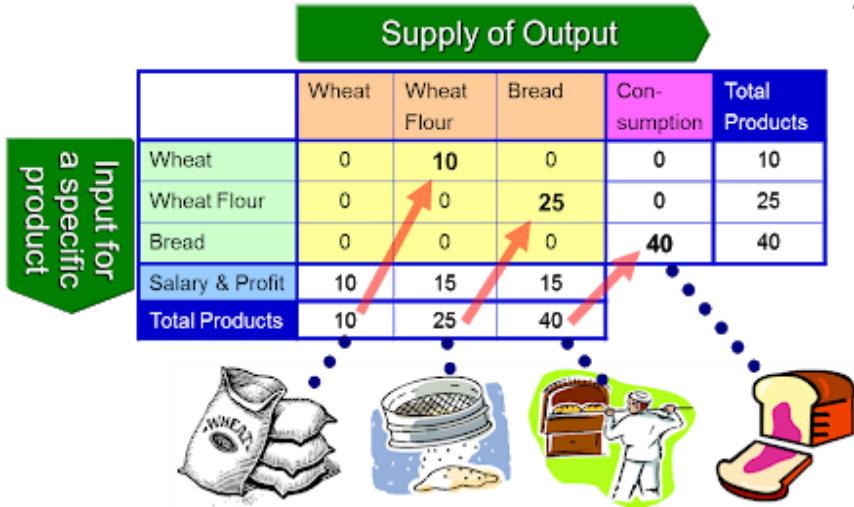


Figure 1: Ocean/Marine/Blue Economy Differences Based on Total Economic Value Model
(Corrected by author based on McIlgorm (2016), Davis et al. (2019))^{viii}

Tsunami Disaster Risk Assessment

Methodology



1. Input-output Analysis

2. GIS Analysis

3. CGE modeling

- 42 sectors
- Social accounting matrix
- Economic structure
- 710,059 offices (155 sectors)
- Tsunami Hazard Map
- Damage estimate
- Aggregate into 19 sectors
- **Impact assessment**
- **Vulnerability Index**

*2011 IO table (released in 2018)

*2020 data

The ratio of buildings in Hakodate city (wooden or non-wooden)

The ratio of buildings in Hakodate city (2014)

	Number of existing buildings	Percentage
Wooden	98,925	79.2%
Non-Wooden	25,960	20.8%

Authors calculated from the summary of tax revenue in Hakodate city(2014)

Tsunami damage classifications

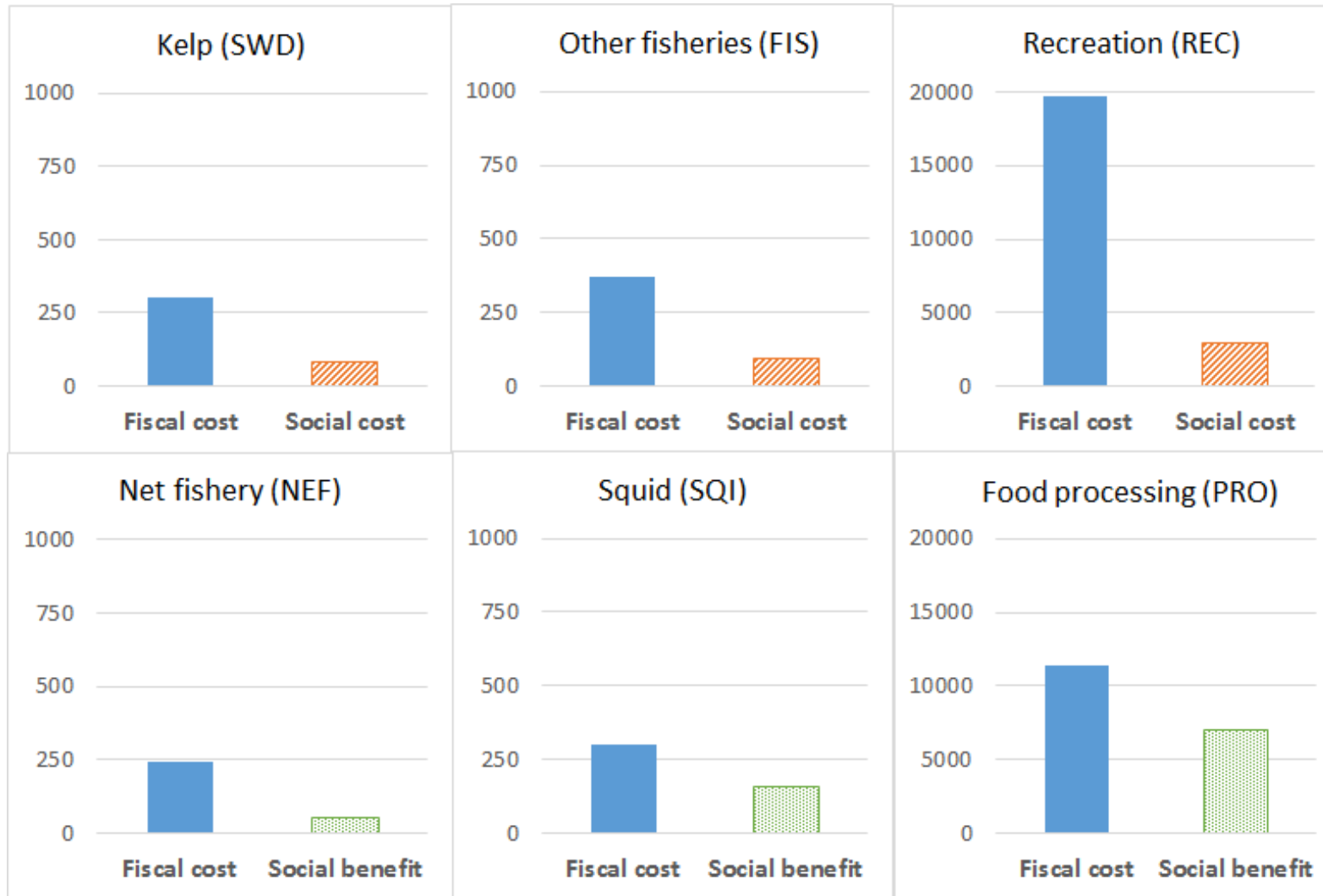
Damage classifications*

Damage Category	Flooded Height(H)	
	Wooden Buildings	Non-Wooden Buildings
100%	$2.0\text{m} \leq H$	$4.0\text{m} \leq H$
50%	$1.0\text{m} \leq H < 2.0\text{m}$	$2.0\text{m} \leq H < 4.0\text{m}$
25%	$0.5\text{m} \leq H < 1.0\text{m}$	$0.5\text{m} \leq H < 2.0\text{m}$
0%	$0.0\text{m} < H < 0.5\text{m}$	$0.0\text{m} < H < 0.5\text{m}$

*Estimated by authors

Source: [Tanaka & Huang \(2020\)](#)

Discussion and Recommendations

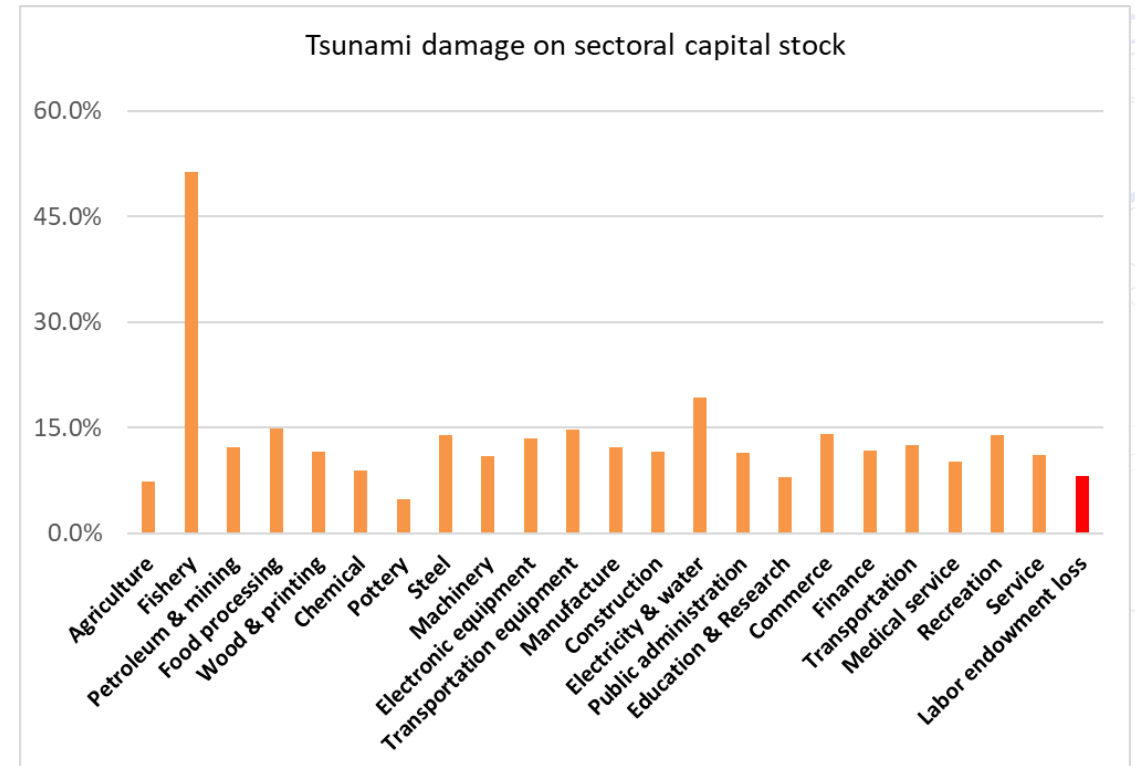
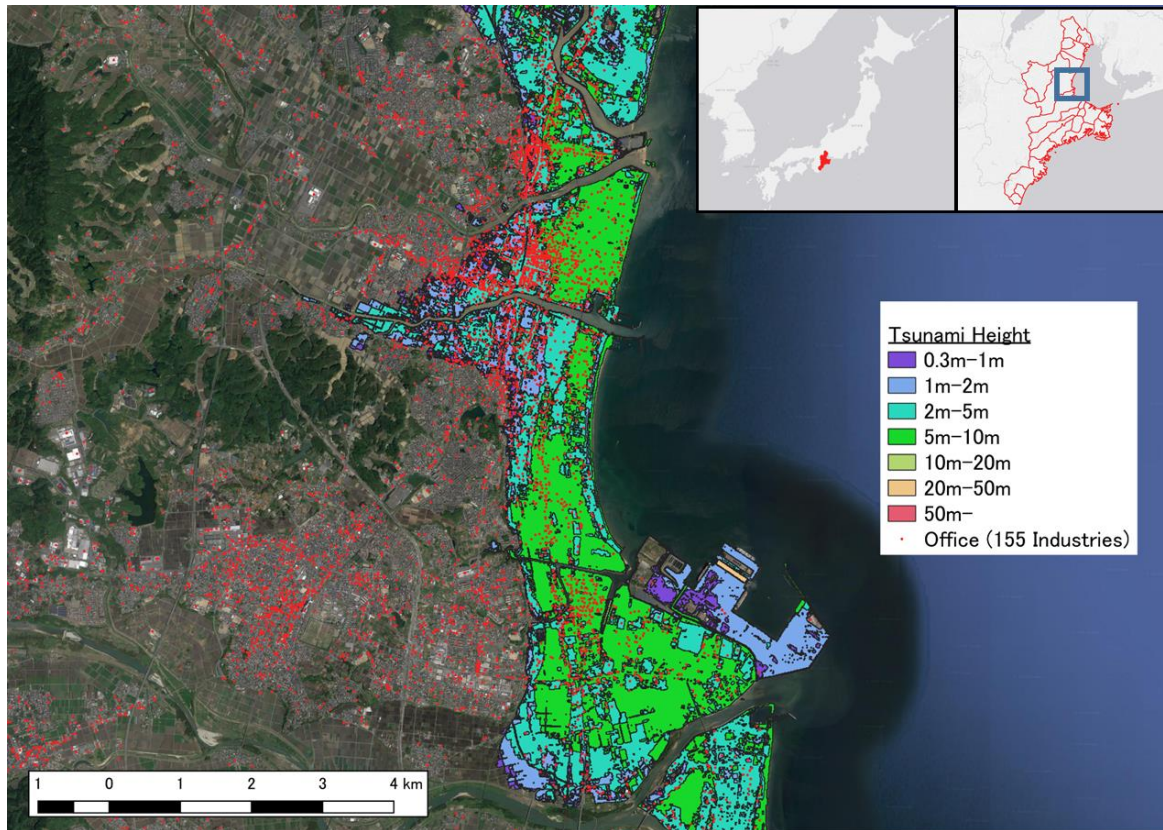


*Unit: mil. JPY

Source: [Tanaka & Huang \(2020\)](#)

- The CGE model, with disaster maps and industry surveys, visualizes and quantifies disaster impacts, offering suggestions for prevention.
- In fisheries - FIS, SQI, SWD, and NEF are highly fragile, needing unique measures to reduce risks in Hakodate.
- Food processing (PRO) requires substantial aid for recovery but promises notable social gains, warranting promotion.

Blue Finance Project: Tsunami Vulnerability Index



Source: [Tanaka, Shiiba, Huang \(2021\)](#)

① Estimation the disaster impact / investment scale

② Analysis of the ripple effect in the regional economy caused

③ Displaying sectoral impact and welfare analysis

- Detailed and precise estimate for city-based to global analysis would be vital for policymaking references.

Vulnerability Index (IV)

$$\text{Vulnerability Index (VI)} = \frac{\text{Disaster impact}}{\text{Capital damage}}$$

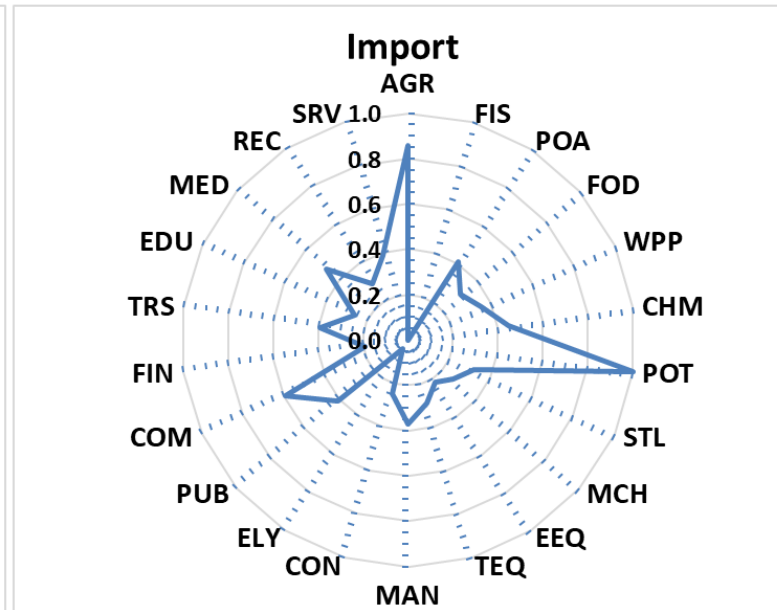
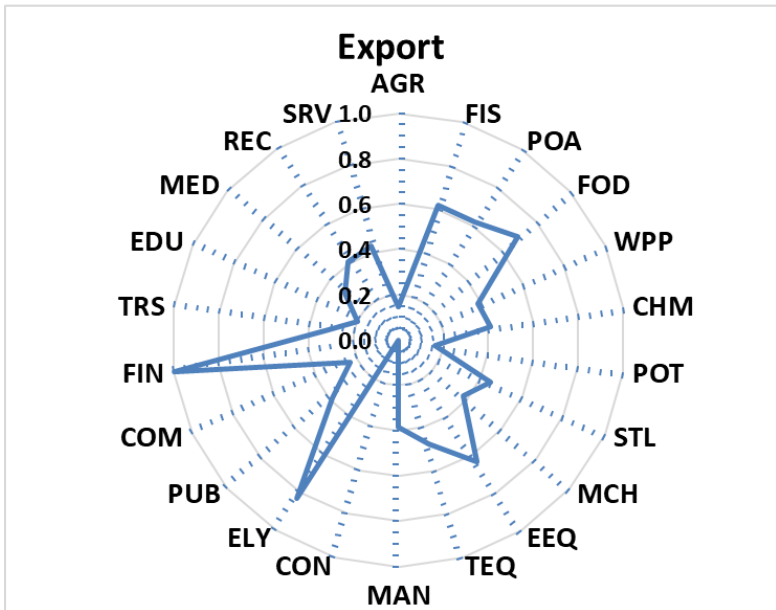
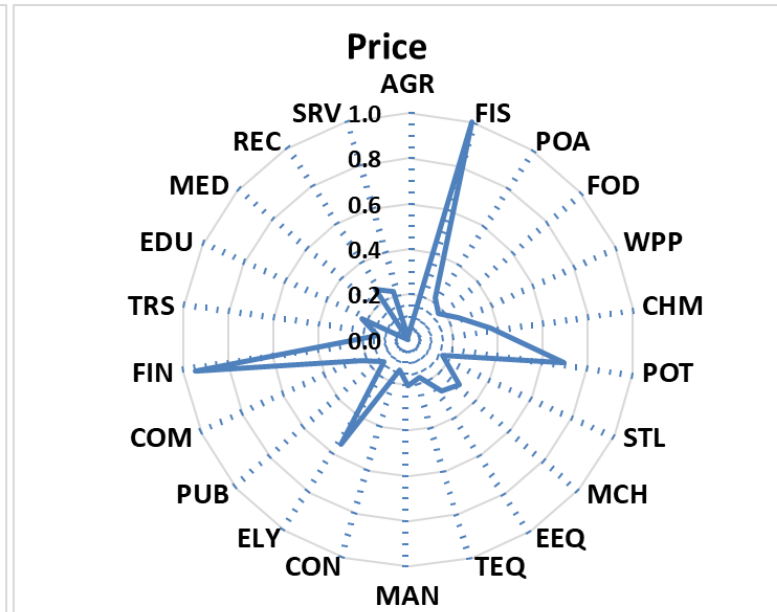
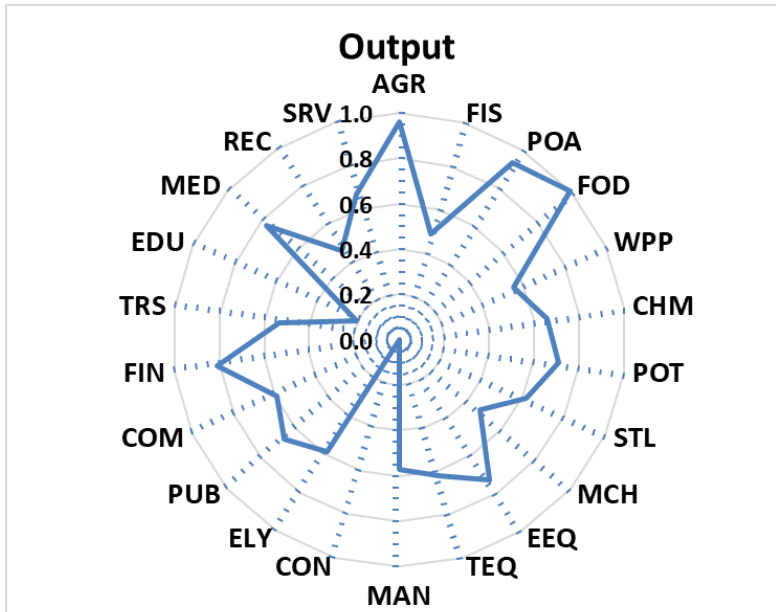
where disaster impact: change of output, price, and external trade

$$\widetilde{VI}_i = \frac{VI_i - VI_i^{Min}}{VI_i^{Max} - VI_i^{Min}}$$

where i : sectoral impact, $VI_i^{Max} - VI_i^{Min}$ is the interval of the index;
the interval could be reversed if VI_i is negative

- This index reveals the overlooked vulnerable industries against tsunami
- Help identify the sensitivity of impact caused by the tsunami damage
- Higher index could refer to the drastic change and the vulnerability

Capital vulnerability index of tsunami



Discussion and policy recommendations

- Fishery (FIS) sector require resilience investment for ex-ante disaster risk reduction
- The regional “vassal and harbor support mechanism” should be developed to increase the capacity toward disaster
- In terms of capital vulnerability index of output, additionally we see Commerce (COM), Food (FOD), Petroleum (POA), and Agriculture (AGR) are also vulnerable against Tsunami, which could have been overlooked.
- The Index could help making ex-ante disaster preparedness and countermeasures for DRR.

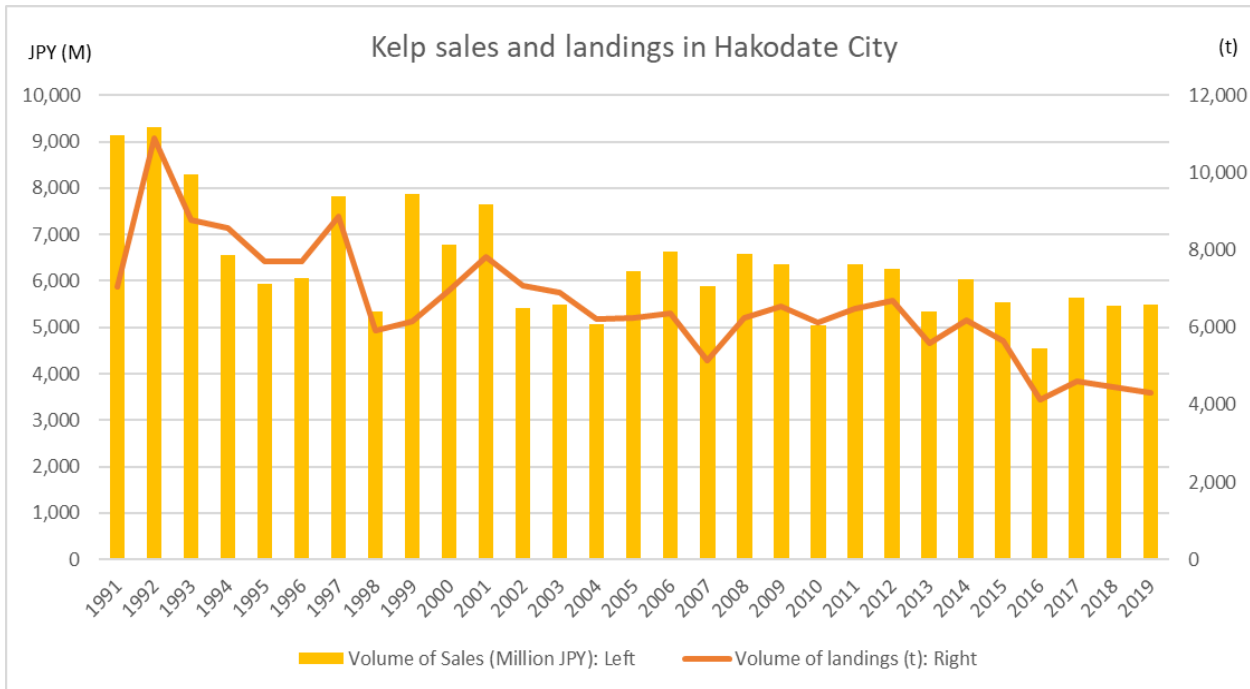
Blue Carbon

The role of Kelp as Blue Carbon

- Blue carbon sinks are built by plants and trees (otherwise known as angiosperms such as mangroves, salt-marsh plants and seagrasses) but the coastal ocean also contains vast areas covered by algal beds.
- Most macroalgal beds (including kelp forests) do not bury carbon, as they grow on rocky substrates where burial is impossible.



Social and Economic value of Kelp



1. Decreasing natural kelp by climate change
2. Shrinking population of fishery sector.
3. Aging problem.

■ “...oceans blue carbon sinks, along with coral reefs and kelp communities, all fulfil very important functions in the coastal zone while providing opportunities for jobs and coastal prosperity” (UNEP 2009).

■ Kelp itself has high economic impacts on regions where it has been consumed as food resource.

■ Japan has long history of eating kelp, which have created Japanese food culture.

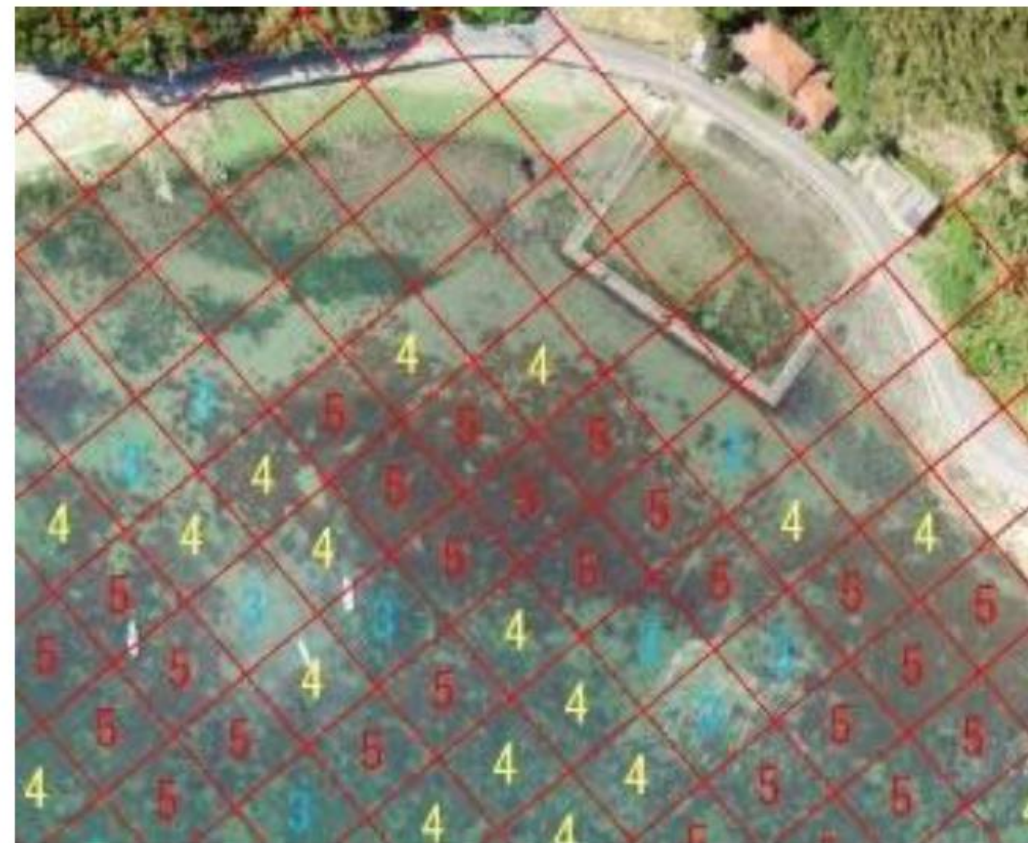
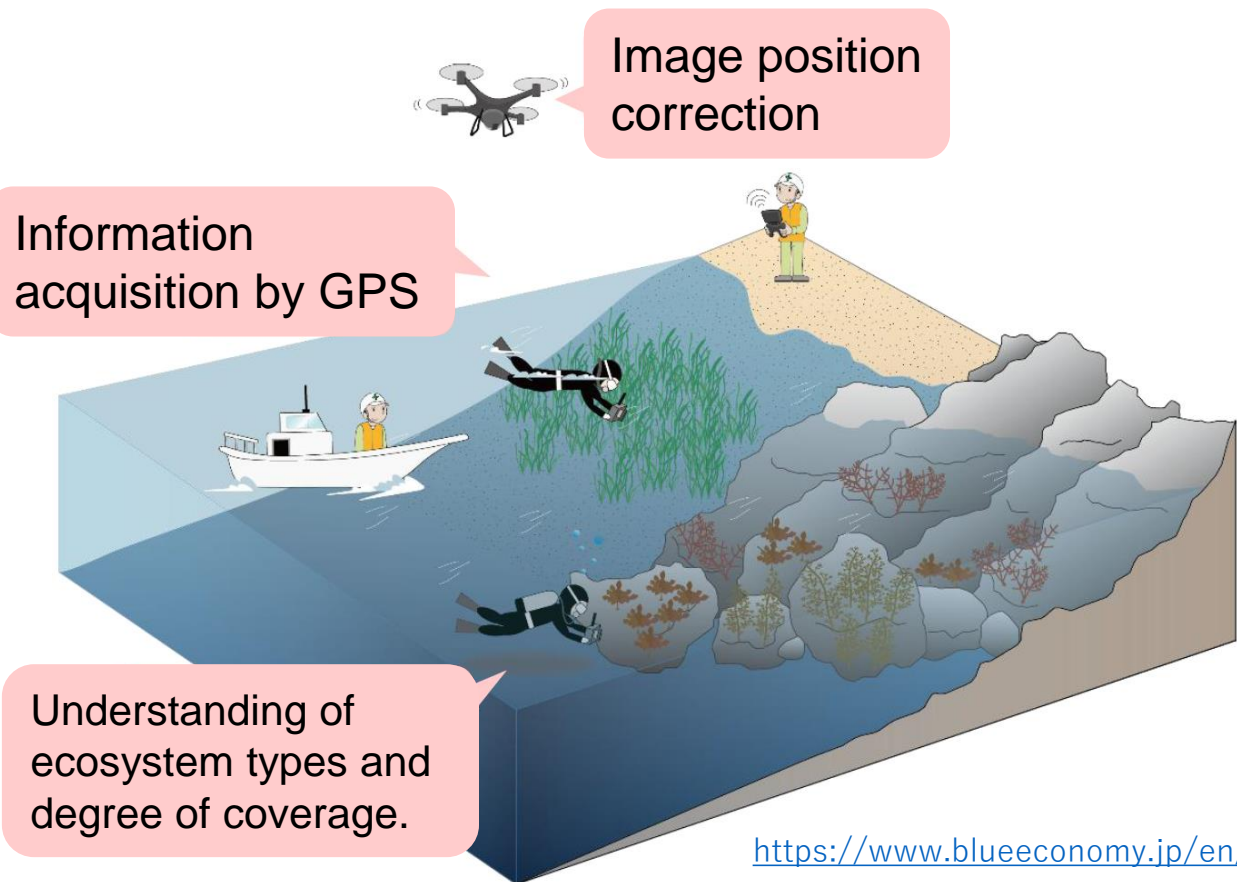
■ Hokkaido Prefecture produces more than 90% of kelp in Japan.



Japan Blue Economy
association

Promote research and development of technologies and methods necessary to revitalize projects that will help conserve and restore coastal areas through close cooperation among researchers, engineers, and practitioners in various fields and capacities.

Field investigation and J carbon credit (tCO2 year) certification



<https://www.blueeconomy.jp/en/>

Methodology

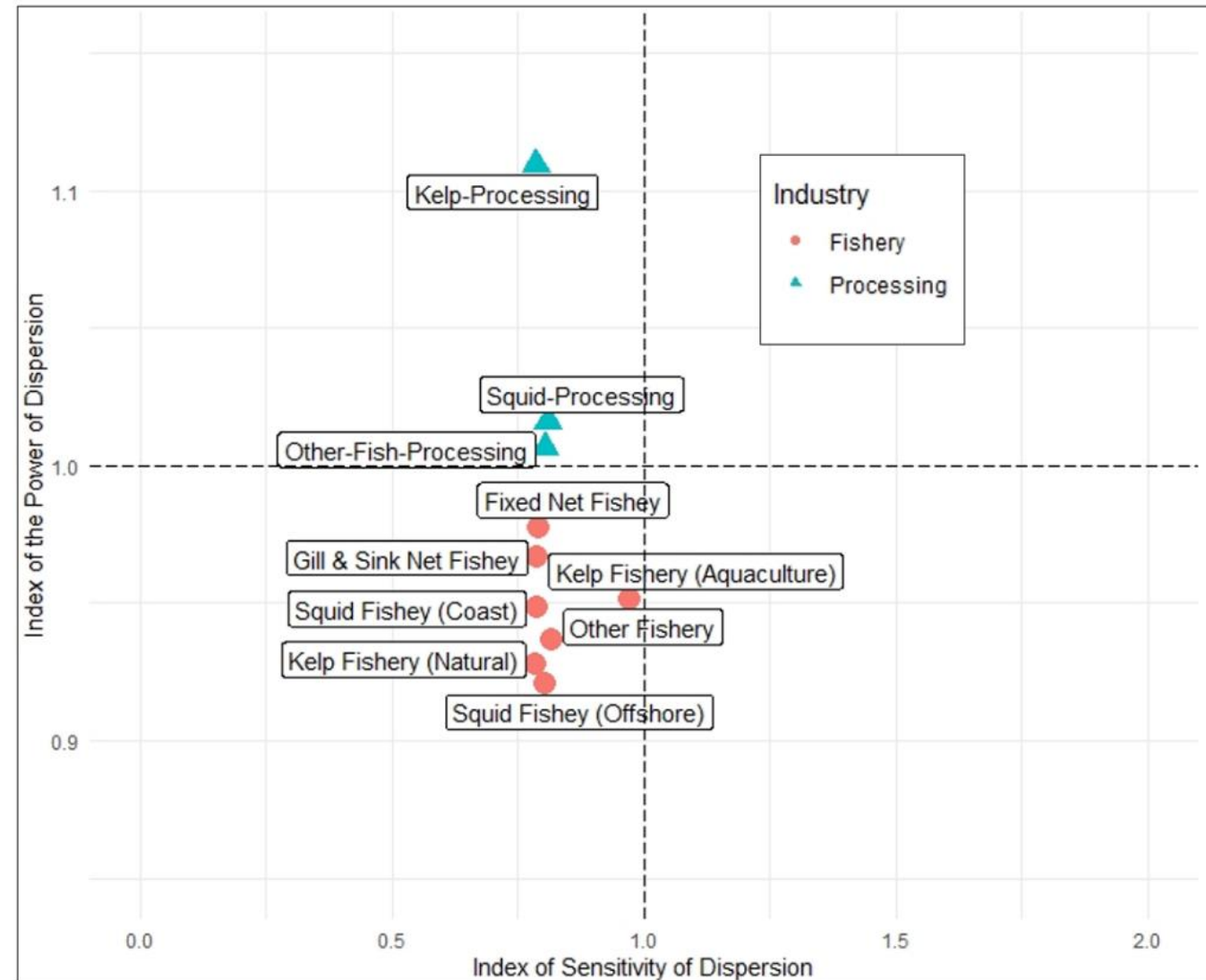
Economic effect of industry
(Input-output analysis)

Inverse coefficient matrix

$$\Delta X = [I - (I - \tilde{M})A]^{-1}[(I - \tilde{M})\Delta Y + \Delta E]$$

Sector	Inverse Matrix Coefficients
Kelp-Fishery (Natural)	1.18
Kelp-Fishery (Aquaculture)	1.21
Kelp-Processing	1.41

Source: [Tanaka, Huang, Watanabe \(2023\)](#)





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BLUE ECONOMY AND BLUE FINANCE

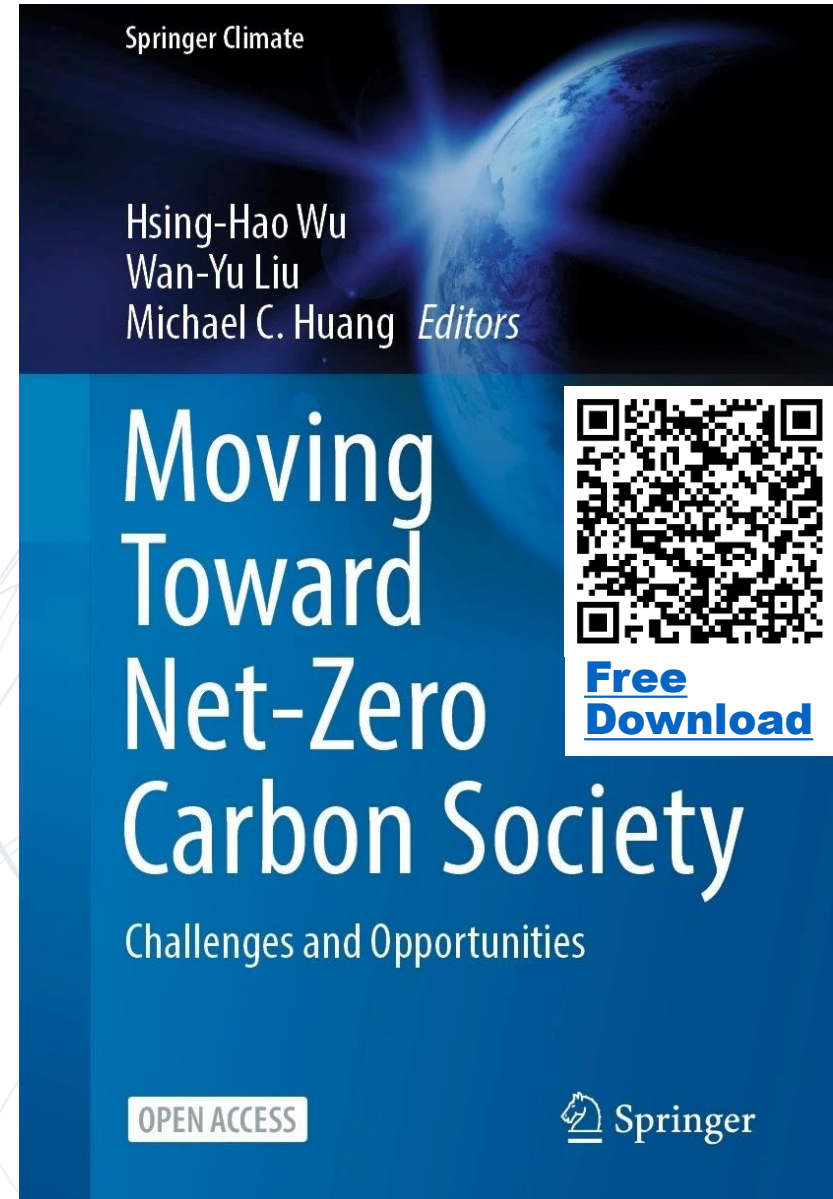
Toward Sustainable Development and Ocean Governance



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Edited by Peter J. Morgan, Michael C. Huang, Michelle Voyer, Dominique Benzaken, and Atsushi Watanabe

ASIAN DEVELOPMENT BANK INSTITUTE



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Moving Toward Net-Zero Carbon Society

Challenges and Opportunities

OPEN ACCESS

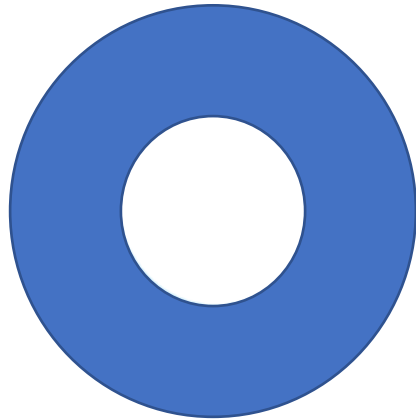
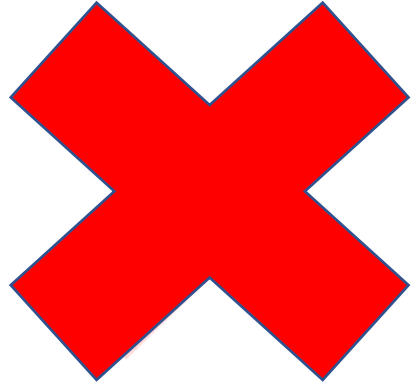


Blue Finance

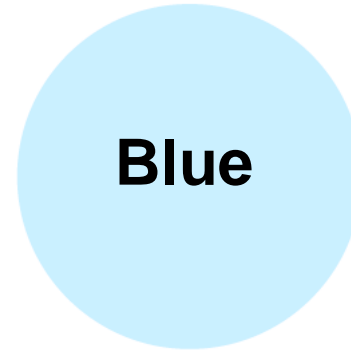
Background

1. Insufficient practices and methods have yet been compiled to solve the social problem of ocean issues. Lack of investment evaluation criteria.
2. Only few marine impact investment projects due to a lack of empirical examples and evidence-based research.
3. Blue impact investment lacks cross-industry initiatives and public-private partnerships with experts in the financial industry, and no platform exists yet.

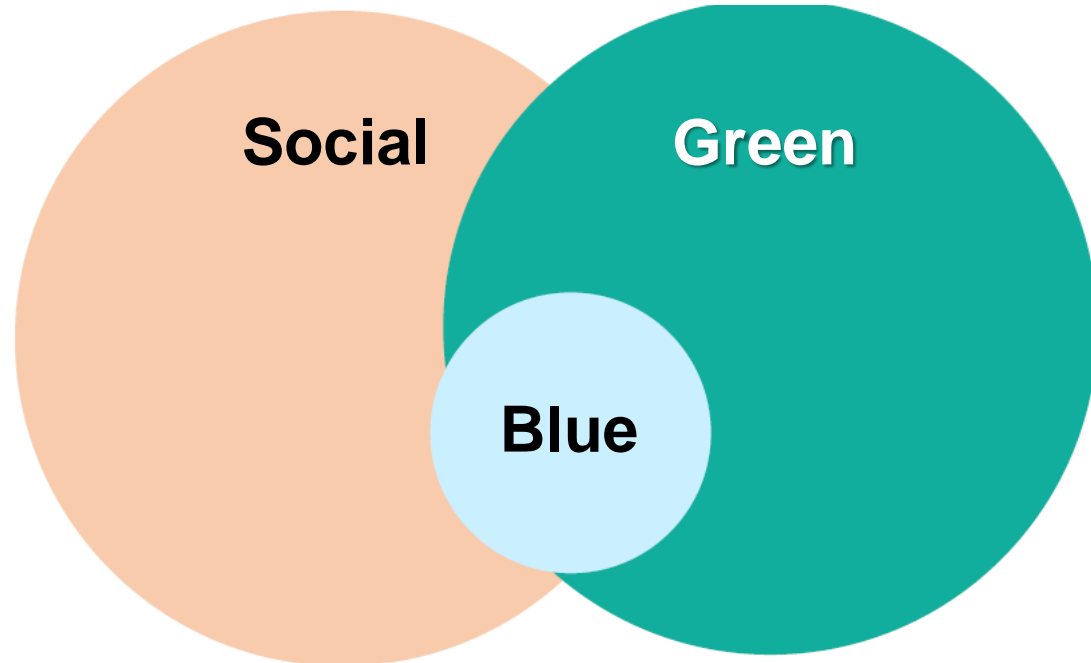
How do we think of “Blue”?



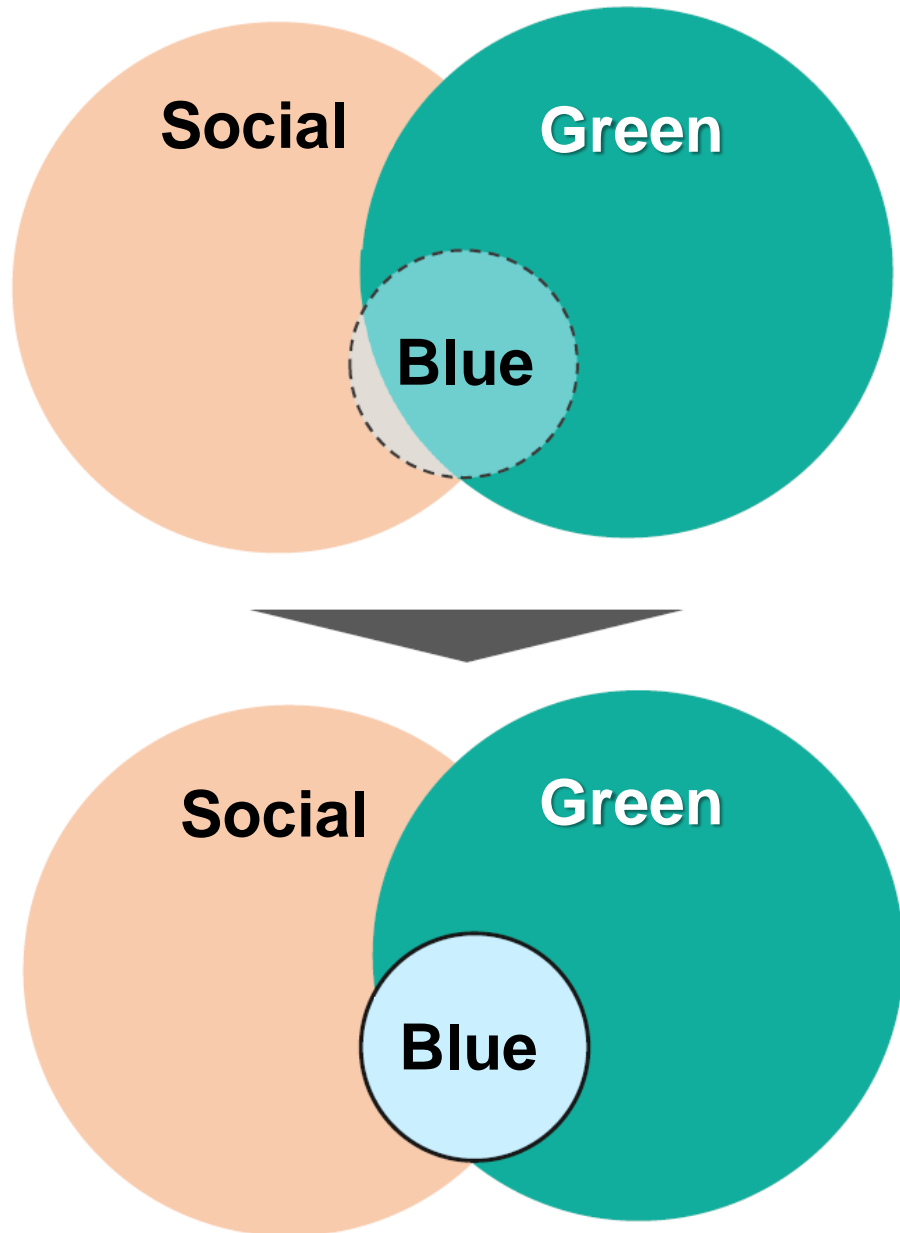
Completely different



Based on the concept of green and social
*depends on the usage of fund
We determine it social and/or green/blue

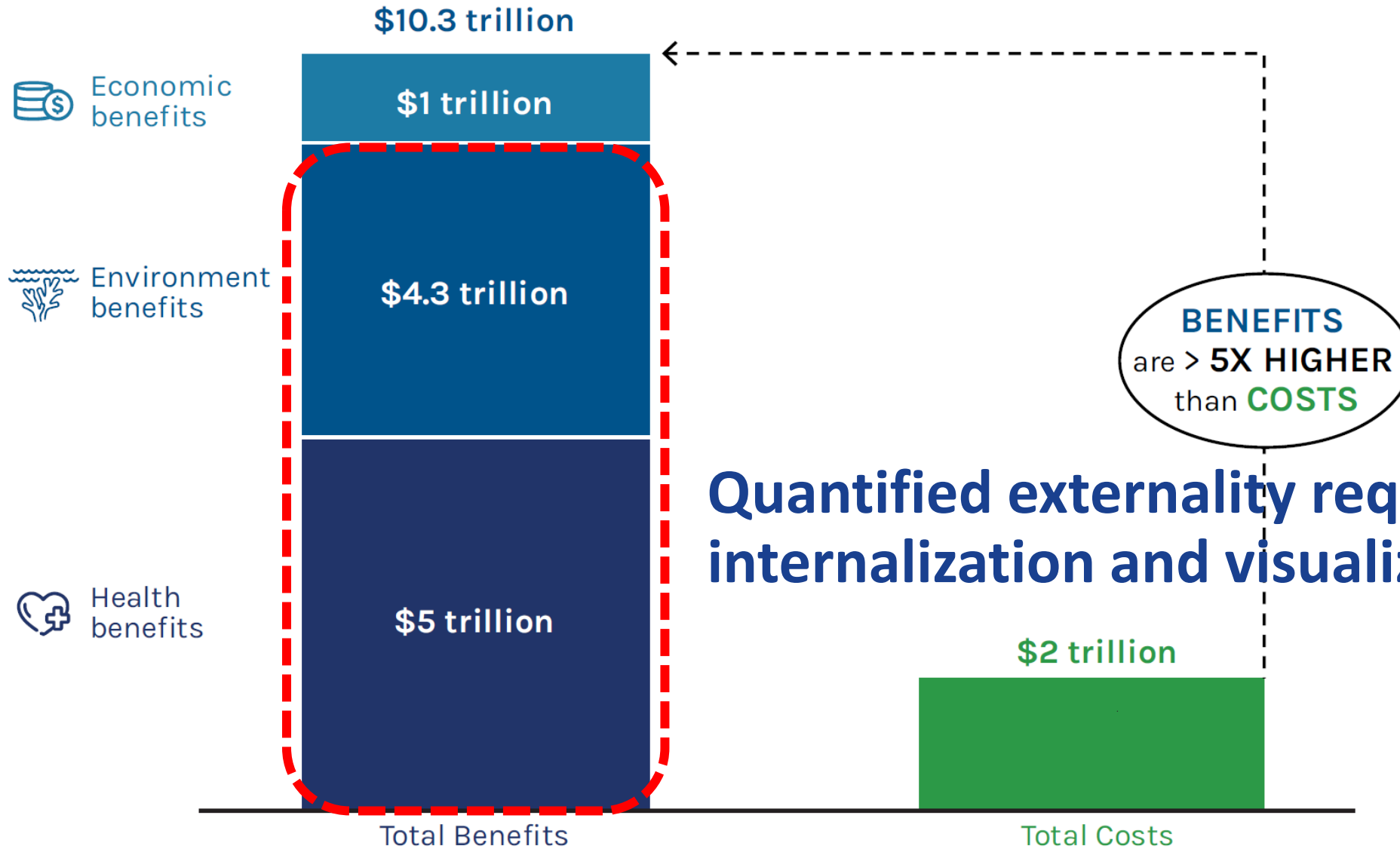


What does it mean if labelled by “Blue”?



- The specifics of the areas in which the "blue" funds will be used, and the indicators used in reporting, will encourage project formation.
 - Labeling them "blue" will make it easier for investments and loans to proceed.
 - Note: Labels must be assigned in accordance with international principles and national guidelines.
 - Example: green bonds. The creation of the principle has led to a dramatic increase in investments and loans.
 - For bonds: The greenium (lower interest rate) effect has been observed in green bonds.
- Incentives to issue bonds

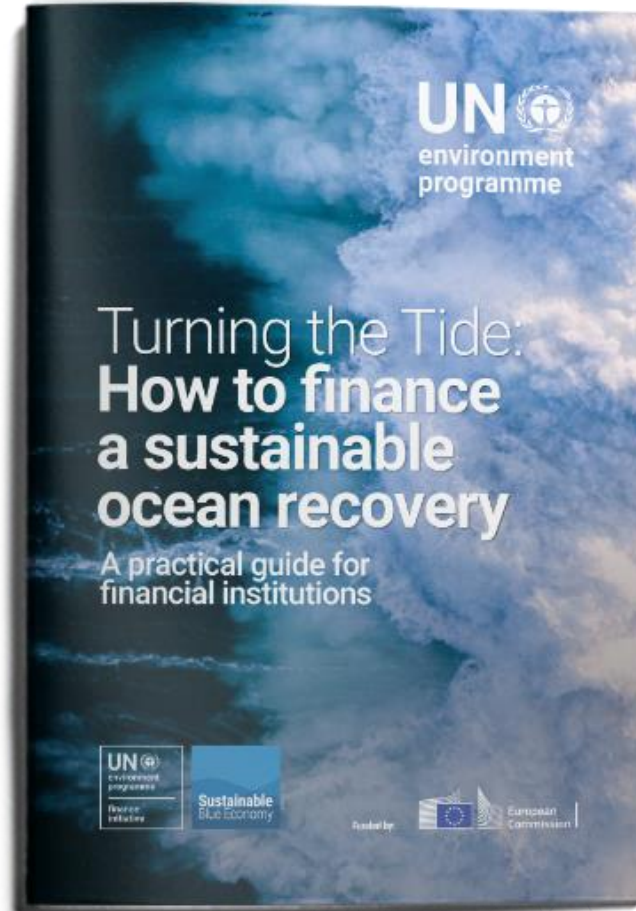
Sustainable Ocean Investments Yield Benefits at least 5x higher than costs.



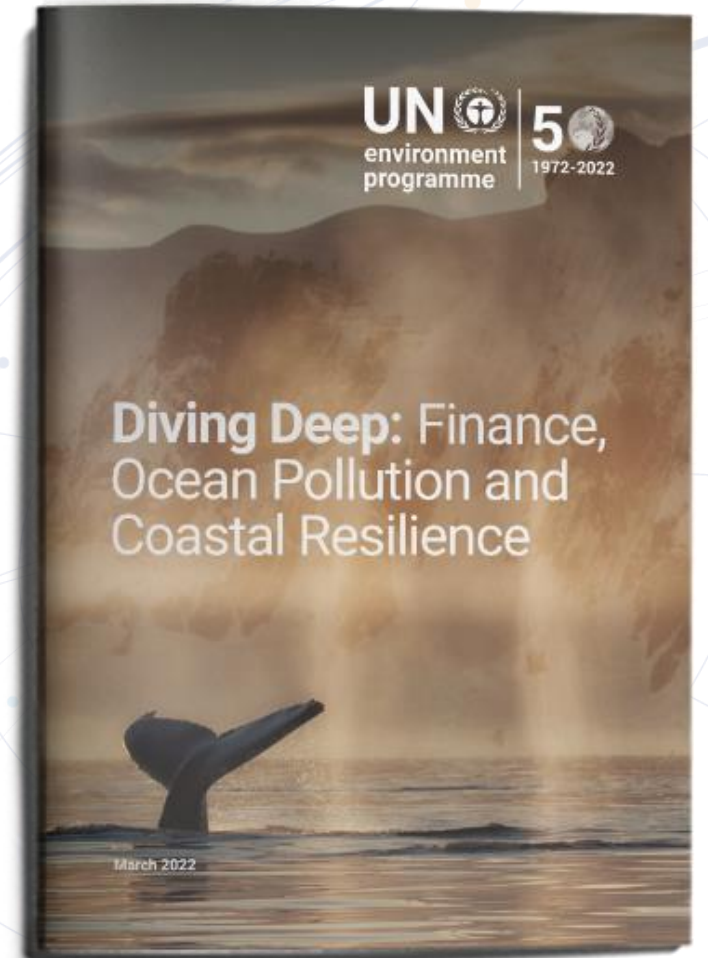
Criteria and indicators

1. Protective
2. Compliant
3. Risk-aware
4. Systemic
5. Inclusive
6. Cooperative
7. Transparent
8. Purposeful
9. Impactful
10. Precautionary
11. Diversified
12. Solution-driven
13. Partnering
14. Science-led

- Design evidence-based assessments to evaluate social impact with Blue Impact Finance initiatives



<https://www.unepfi.org/publications/turning-the-tide/>



<https://www.unepfi.org/publications/diving-deep/> 31

GREEN BOND PRINCIPLES AND GREEN LOAN PRINCIPLES BROAD CATEGORIES OF ELIGIBILITY

Blue Finance Area	Pollution Prevention and Control	Natural Resource Conservation	Biodiversity ⁷	Climate Change	
				Mitigation	Adaptation
A. Water supply	***	**	**	***	**
B. Water sanitation	***	**	**	***	**
C. Ocean-friendly and water-friendly products	***			*	
D. Ocean-friendly chemicals and plastic related sectors	***			*	*
E. Sustainable shipping and port logistics sectors	***	*	**	***	*
F. Fisheries, aquaculture, and seafood value chain	***	**		*	*
G. Marine ecosystem restoration	**	***	***	*	*
H. Sustainable tourism services		**	**		
I. Offshore renewable energy production		*	**	***	
	***	Primary or direct effects	Light blue	Minor impact	
	**	Secondary or indirect effects	Medium blue	Some impact	
	*	Tertiary or derived effects	Dark blue	Strong impact	



Creating Markets, Creating Opportunities

Mapping Blue Activities under the Green Bond Principles and Green Loan Principles

<https://www.ifc.org/wps/wcm/connect/4a61d420-82b2-41e9-b2fd-b7fb0af38bba/IFC-Guidelines-for-Blue-Finance.pdf?MOD=AJPERES&CVID=ogvh-4f>

Major Characteristics of Ocean Finance Capital

RETURN
(financial)

MAJOR CAPITAL TYPES

EQUITY
 • e.g. public equity, investment funds

Private finance sector, e.g., equity investors, venture capitalists, commercial banks, pension funds

SMALL SCALE ————— LARGE SCALE

BLENDED FINANCE
 • Combines ODA with private and public sources

Same providers as for debt, equity, and impact capital

SMALL SCALE ————— LARGE SCALE

IMPACT-ONLY
 • e.g. corporate social responsibility, public grants, philanthropy, ODA

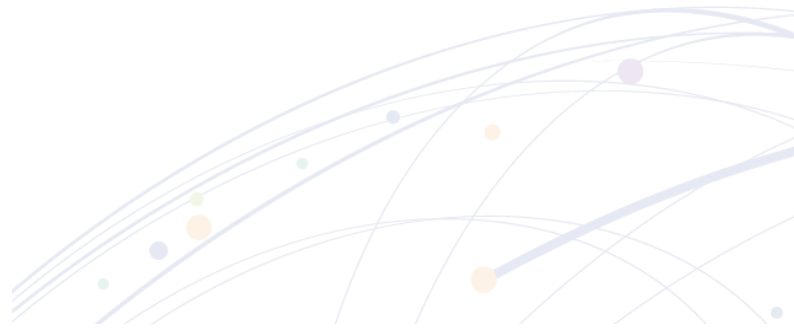
Philanthropic foundations, NGOs, international financial institutions, corporations, ODA agencies

SMALL SCALE ————— LARGE SCALE

DEBT
 • e.g. loans, bonds

Private and public sector, e.g., governments, corporations, multilateral development banks. ODA agencies, crowd funding

SMALL SCALE ————— LARGE SCALE



Key players/ providers of capital type include:

- Philanthropic foundations, NGOs, official development assistance (ODA)
- Public sector, e.g. governments, multilateral development banks
- Private sector, e.g. corporations, commercial banks, equity investors

Relative scale of investment

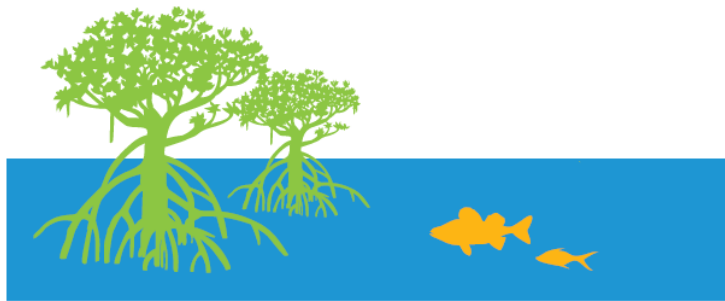
Source: Sumalia et al. (2021)
<https://www.nature.com/articles/s41467-021-23168-y>

RISK
(financial)

ADB BLUE BONDS

ADB

FINANCE FOR OCEAN-POSITIVE INVESTMENTS IN ASIA AND THE PACIFIC



Marine and Coastal Ecosystem Management and Restoration:



Marine Pollution Control:



Sustainable Coastal and Marine Development:

MALDIVES: Greater Malé Waste-to-Energy Project

ADB finance: \$73 million. Blue bond finance: 100%

REGIONAL: Indorama Ventures Blue Loan Project

ADB finance: \$50 million. Blue Bond finance: \$37.5million

Overview

name	Maruha Nichiro Corporation 1st Unsecured Corporate Bond (Blue Bond)
Issue date	5 years
Bond amount	5 billion yen
interest rate	0.55% per annum
Date of decision	October 27, 2022
payment date	November 2, 2022
redemption deadline	November 2, 2027
Lead underwriter	Mizuho Securities Co., Ltd., Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.
Structuring agent *	Mizuho Securities Co., Ltd.
External evaluation	Rating and Investment Information, Inc. (R&I)
Use of funds	Environmentally sustainable fishery and aquaculture business



Japan's first blue bond to secure the necessary funds for activities aimed at creating "environmental value".

Eligible criteria	Eligible Projects	GBP Category
<p>[ブループロジェクト] 環境持続型の漁業・養殖事業</p>	<p>Salmon land-based aquaculture business.</p>	<p>"Prevention and management of pollution, sustainable environmental management related to biological natural resources and land use"</p>

WHY Blue Impact Finance?

Blue Economy

Sustainable development for ocean economy

“Blue Impact Finance”

Emphasis on venture, research institute collaboration for innovative social impact

Blue Finance

Financing instruments for blue economy related project

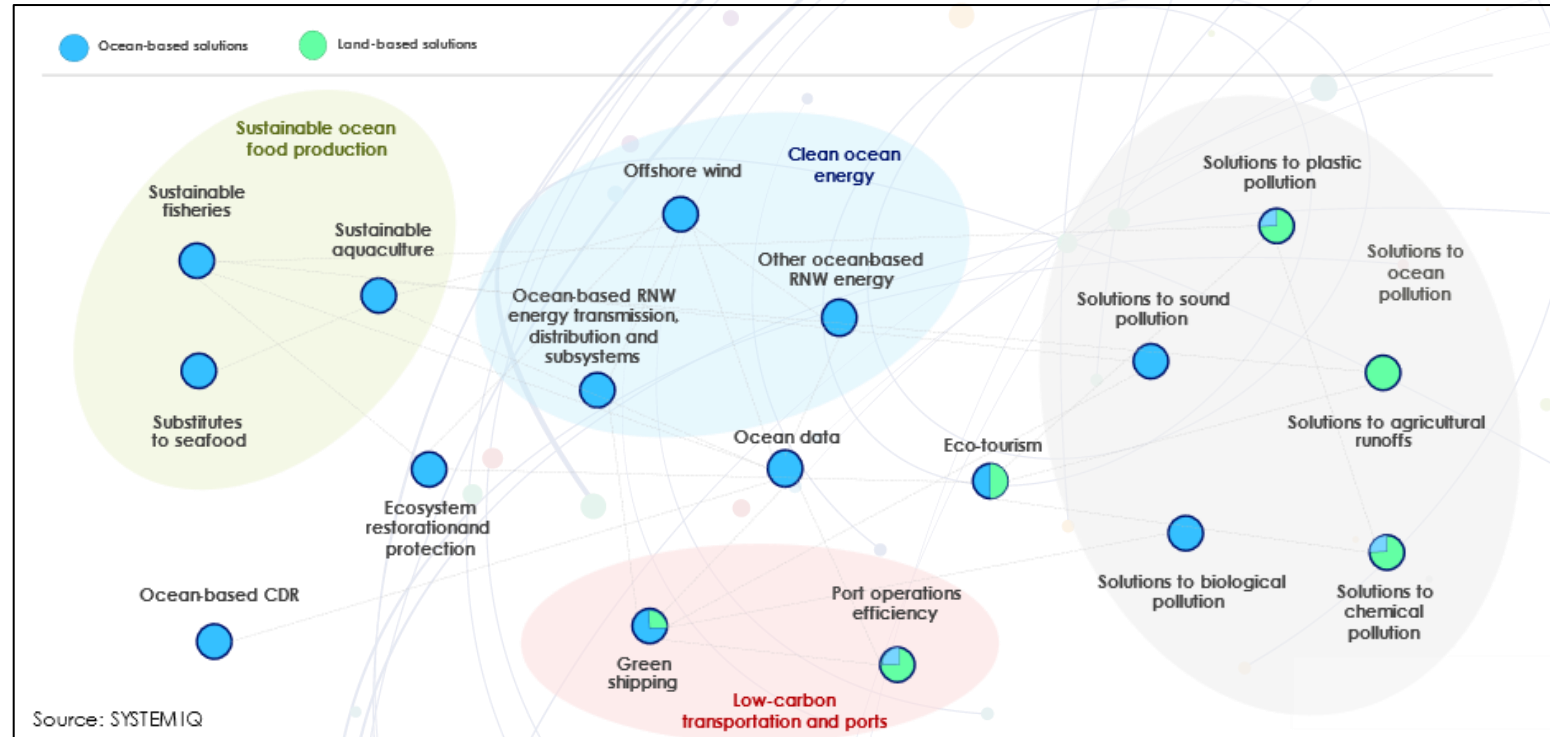
Measuring blue impact

THE OCEAN IMPACT NAVIGATOR

A NEW IMPACT MEASUREMENT FRAMEWORK FOR THE OCEAN INNOVATION ECOSYSTEM



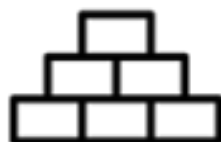
- Emerging ocean sectors
- Evaluate venture's blue impact
- Evidence-based Quantitative and qualitative approach



A harmonised impact framework offers 3 main contributions



Identifying interventions with real impact



Aggregating and communicating on progress towards a Sustainable Ocean Economy



Simplifying impact measurement for start-ups

Process for developing the framework

Survey

Preliminary KPI survey among 1000 OS members in November 2021 to inform and help scope the project

Interviews

Interviews with members of the 1000 OS coalition and players in the wider blue investment space to understand the status quo, pain points and aspirations for impact measurement

Impact 'Universe' analysis

Evaluation of 11 existing impact frameworks, mapping their contributions and limitations to measuring impact for oceans

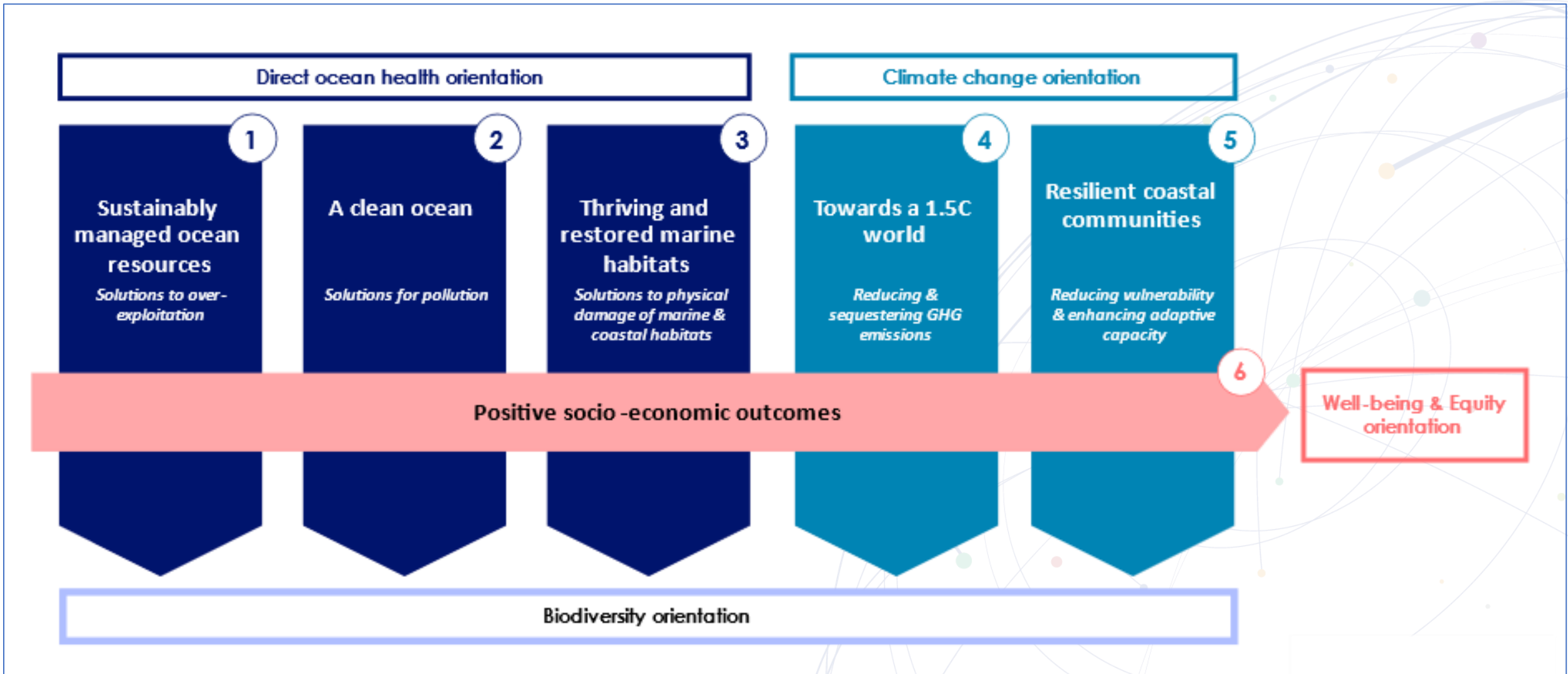
Working Group collaboration

Bi-weekly calls with the core 1000 OS working group to discuss, align and collectively problem solve the development of the framework

Case studies & stress testing

Development of case studies showcasing the application of the framework to real start-ups to test and refine

Impact Indicators





Thank You

Think, Do, and Innovate - Tank

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RESEARCH INSTITUTE

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www.spf.org/opri/en/

