

Pentland | Lancaster University

Funded by

LR Foundation

This seminar will outline the project design & theory of change

We would welcome conversations with you about any aspect of this work (contact details on last page)

& in partnership with

ocean centres | HOSTED BY UN Global Compact | SUPPORTED BY LR Foundation

October 20th, 2026

Safer defined

- All corporations have the duty to protect those working for them, ensure communities that they interact with are treated fairly, and to ensure due diligence requirements across their value and supply chains are met: a rights holder focus

- Environmental, social & economic dynamics will drive impacts on workers & communities (in-direct impacts with corporations having a duty to protect against)

- The focus of the study is how corporations might:
  - Be confident to act in this context to ensure rights are up held &
  - Be held responsible by stakeholders for their actions/inaction

Six elements (we will be moving fast)

1. Introducing the ocean (Jean-Baptise Jouffray)
2. Study design & corporate reporting (Jan Bebbington)
3. Characterising the issues (Ophelia Chidgey)
4. Norms for corporate reporting (Tibor Vegh, John Virdin, Hesham Yousef)
5. Analysing disclosures primer (Mahmoud Gad)
6. Q&A … discussion



OCEAN –

& the biosphere

Area

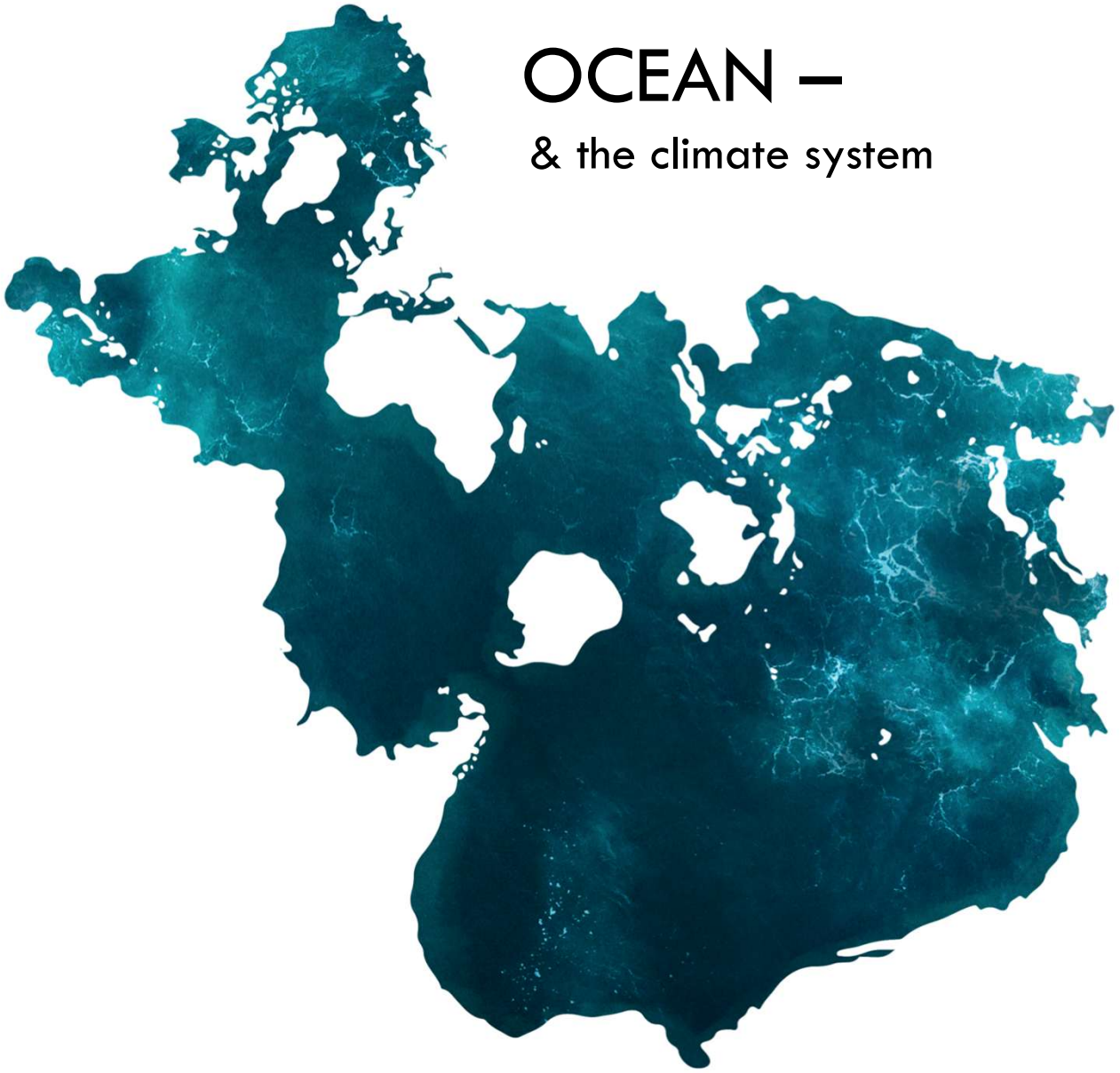


Oxygen



Biodiversity

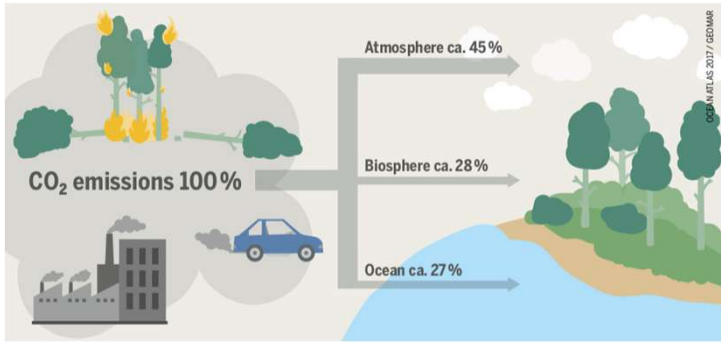




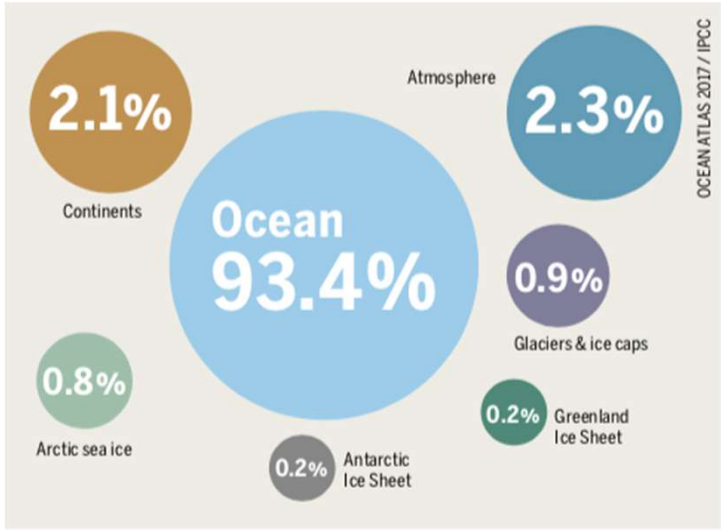
OCEAN –

& the climate system

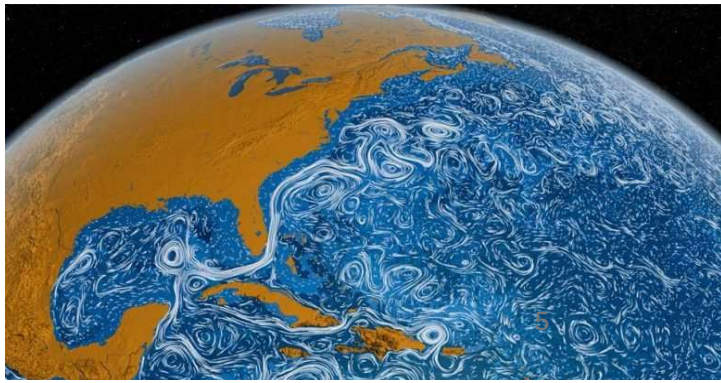
CO_2



Heat



Circulation



OCEAN –

& the economy



Hoegh-Guldberg et al. 2015

GDP
2.5 trillion USD



Global assets
24 trillion USD

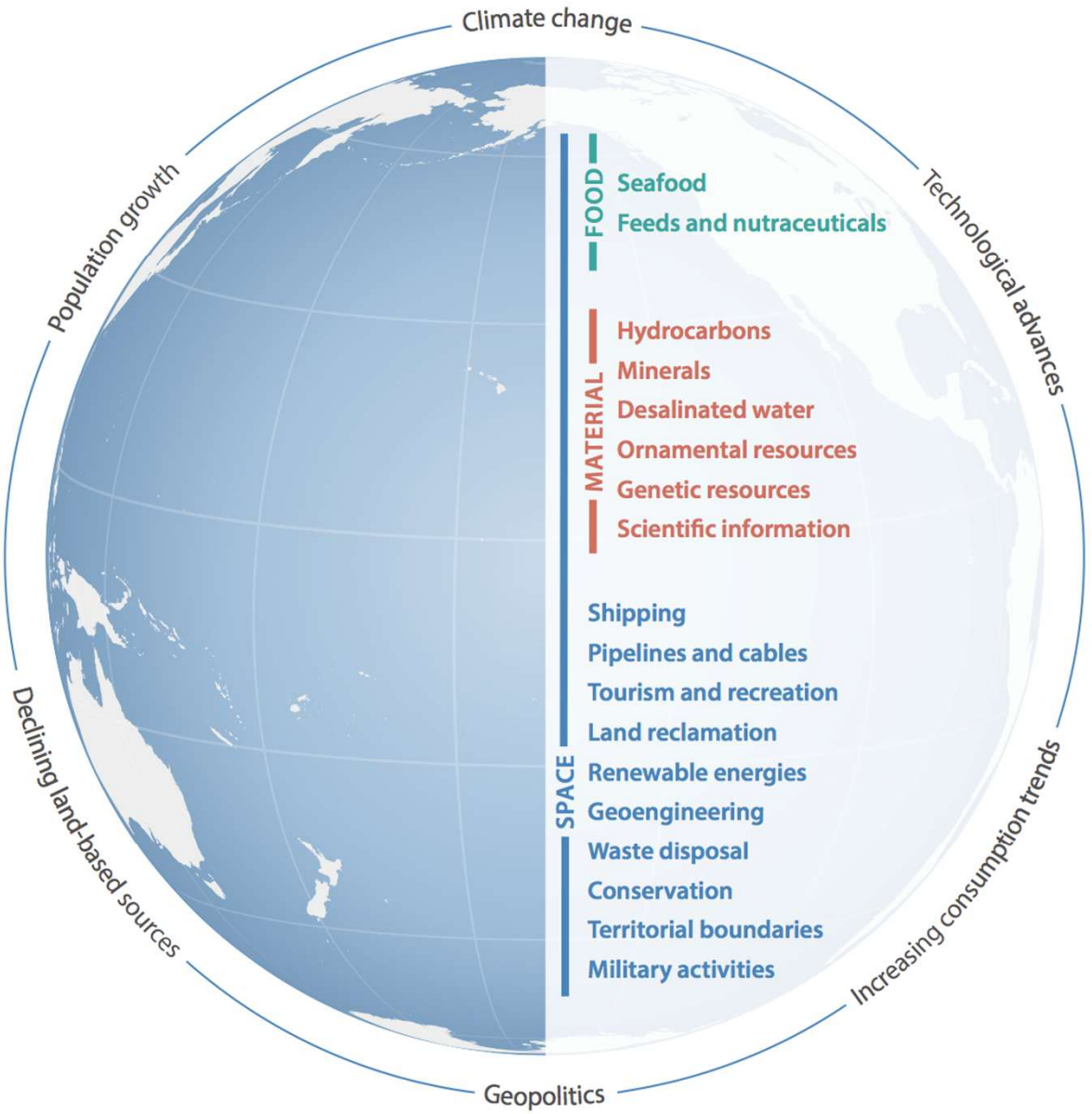





Technology
NEWS TECH
LIVESCIENCE
Underwater Ocean Turbines: A New Spin on Clean Energy?
Live Science › Tech
By Tanya Lewis, Staff Writer | August 5, 2014 09:09am ET
A new frontier for diamond mining: The ocean
Deep-Sea Metal Could Help Build Our Green Energy Future
Is Hiding on the Ocean
Oil and Gas
Benefits the
and the Environment
Marine
6.6K
134
73

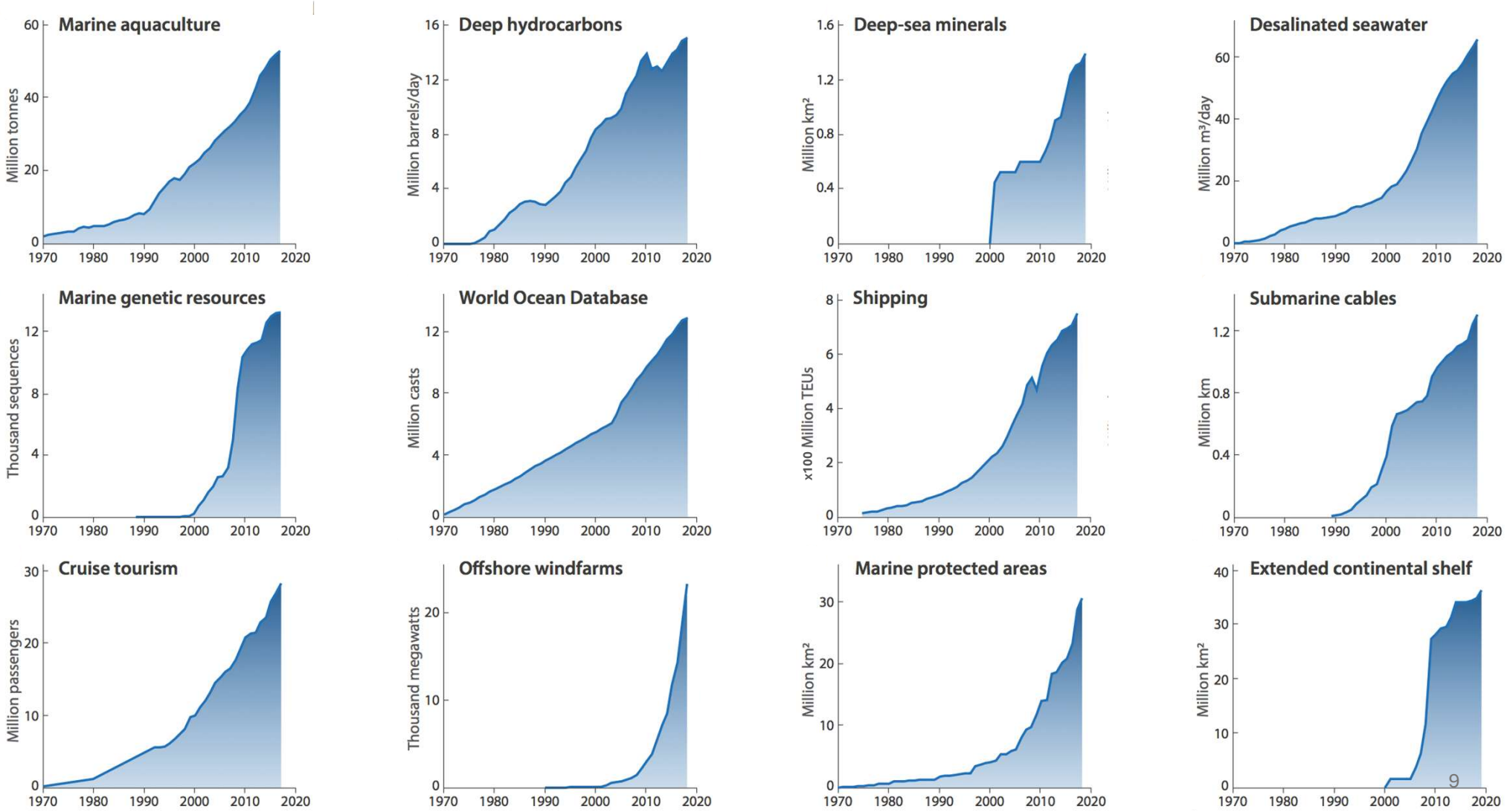
Jouffray et al. 2020, *One Earth*

OCEAN FOR FOOD, MATERIAL, AND SPACE



Jouffray et al. 2020, *One Earth*

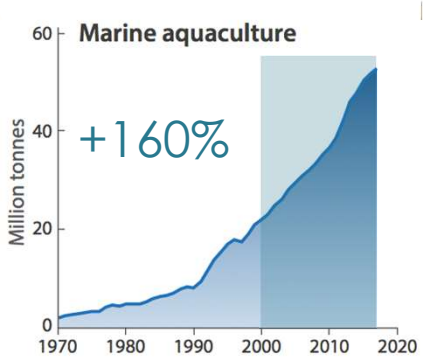
THE BLUE ACCELERATION

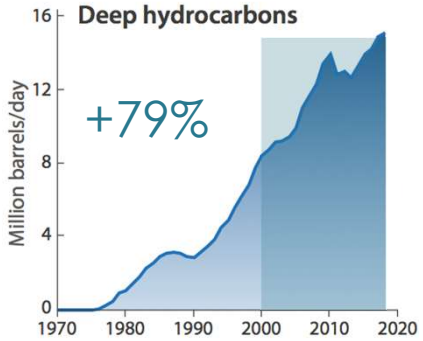


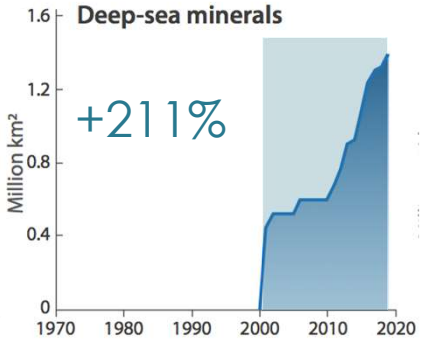
Jouffray et al. 2020, *One Earth*

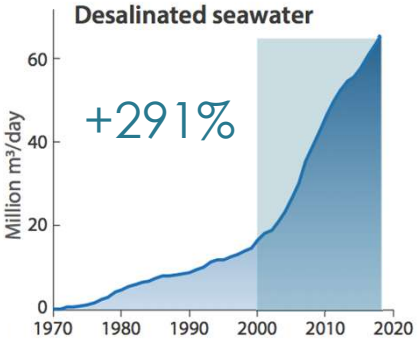
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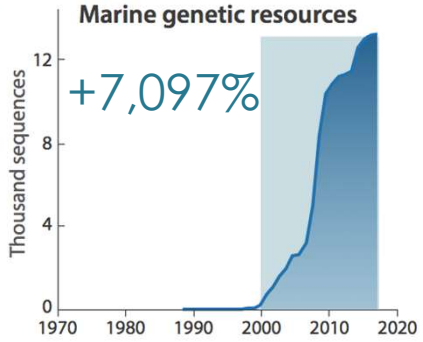
...since 2000

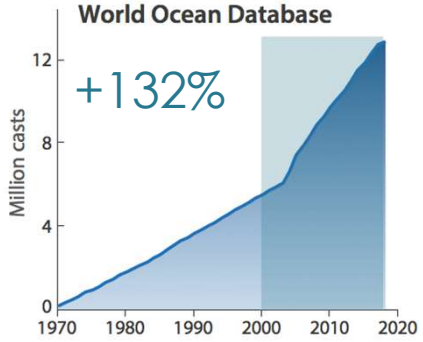


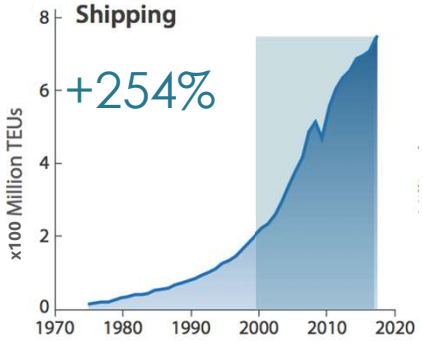


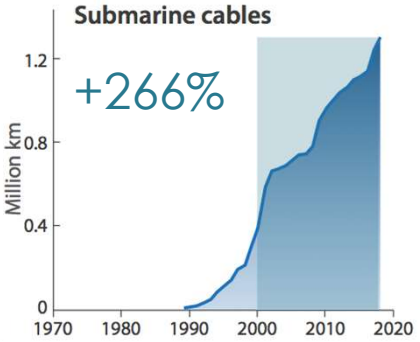


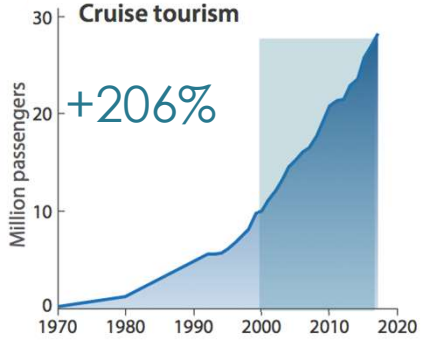


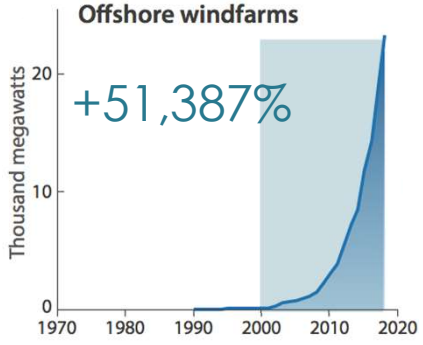


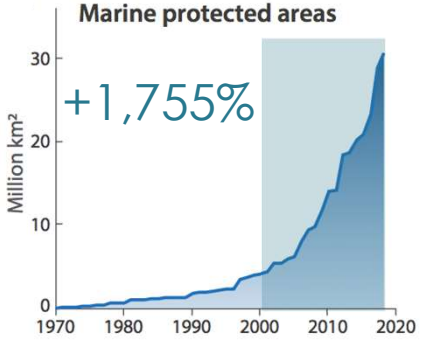


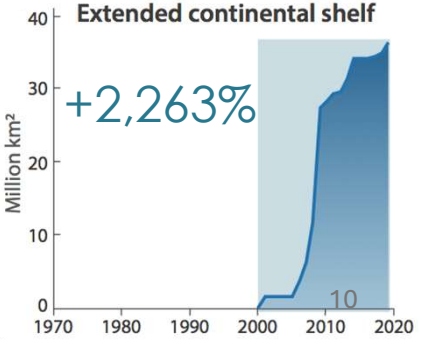














THE ANTHROPOCENE OCEAN


THE
ANTHROPOCENE
OCEAN





THE ANTHROPOCENE OCEAN

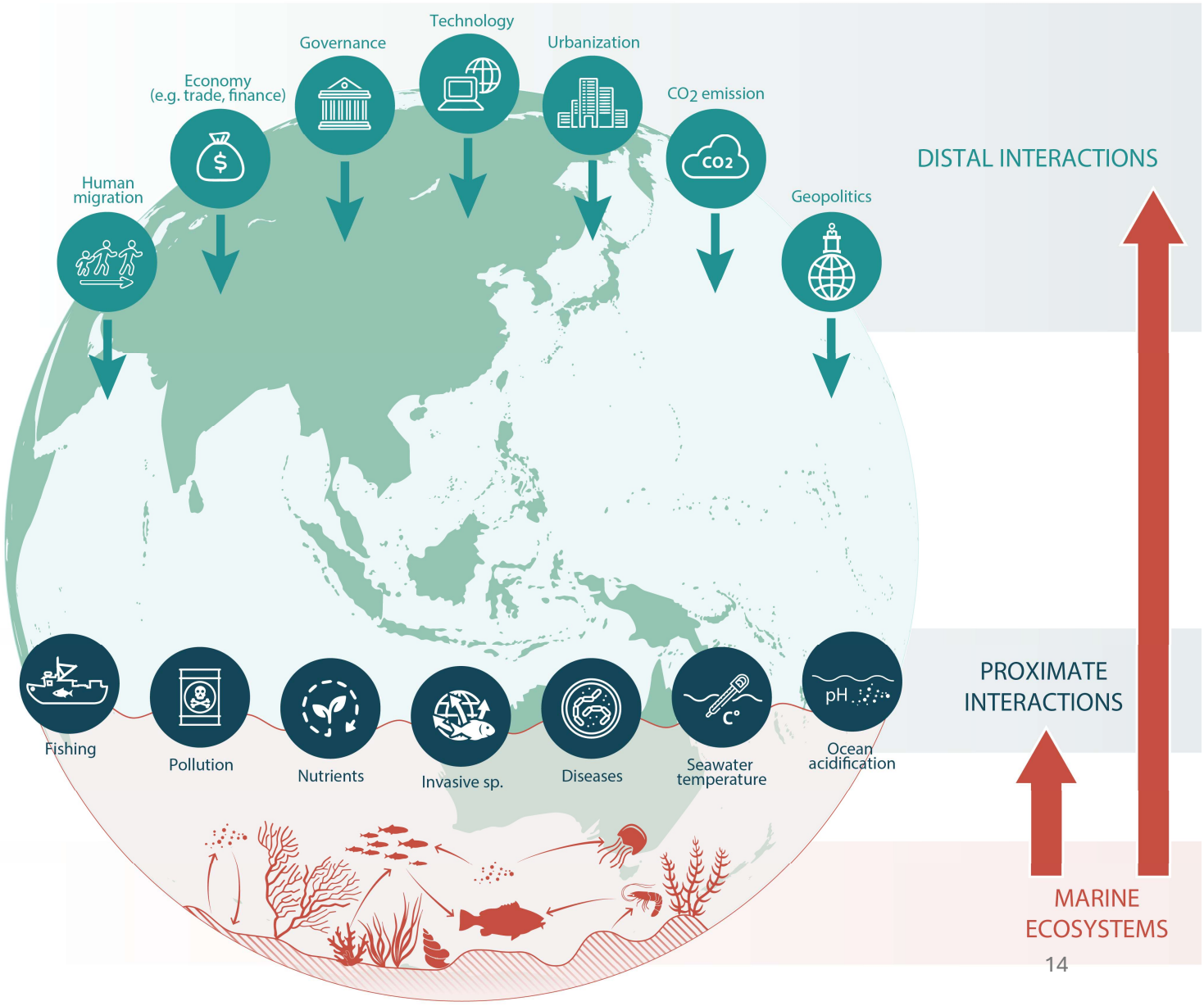


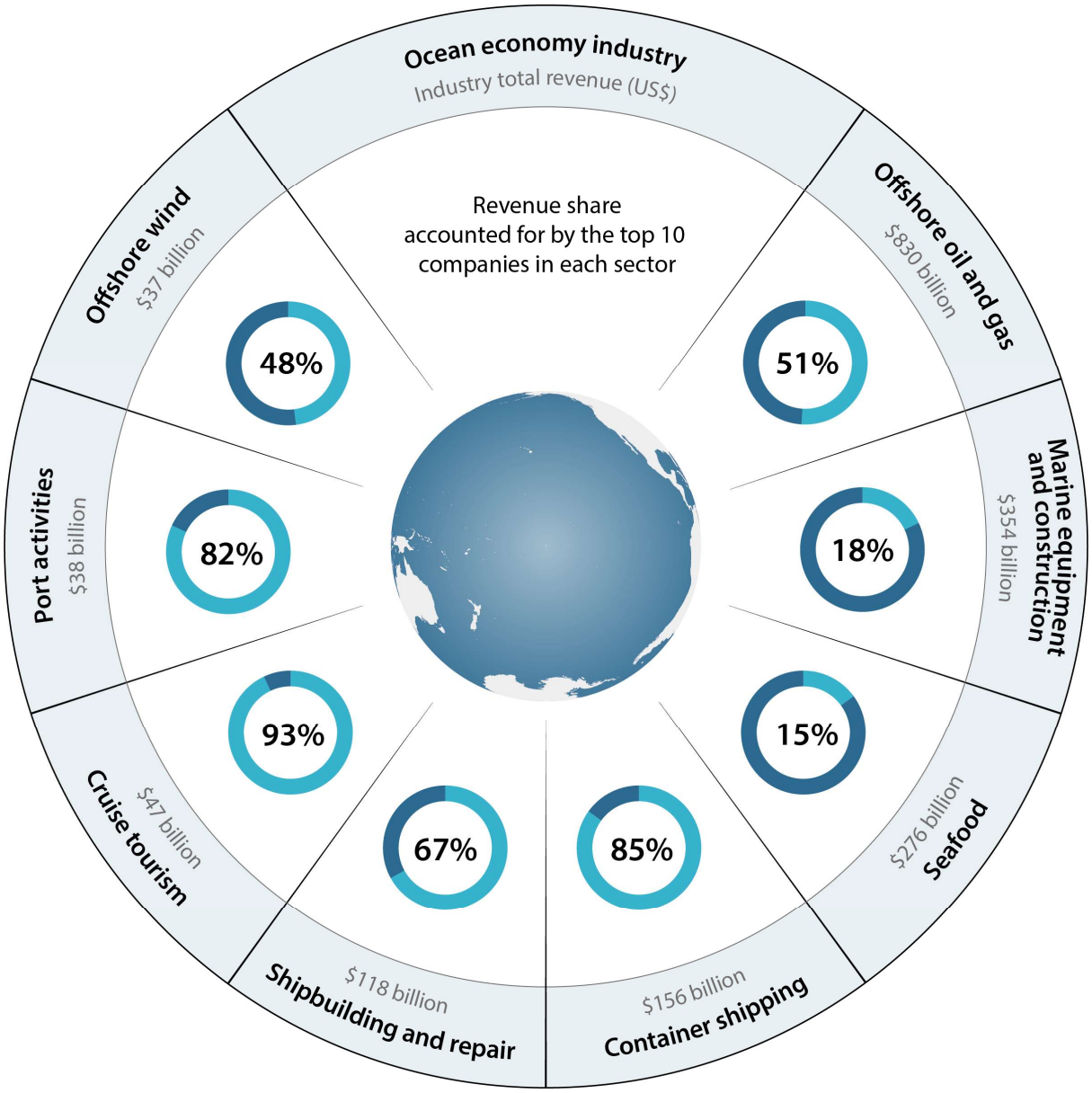


MARINE ECOSYSTEM SCIENCE ON AN INTERTWINED PLANET

Österblom et al. 2016, *Ecosystems*

"Changes in marine ecosystem dynamics are influenced by proximate socioeconomic activities and human-induced biophysical change, both embedded in a much broader and distal socioeconomic context"

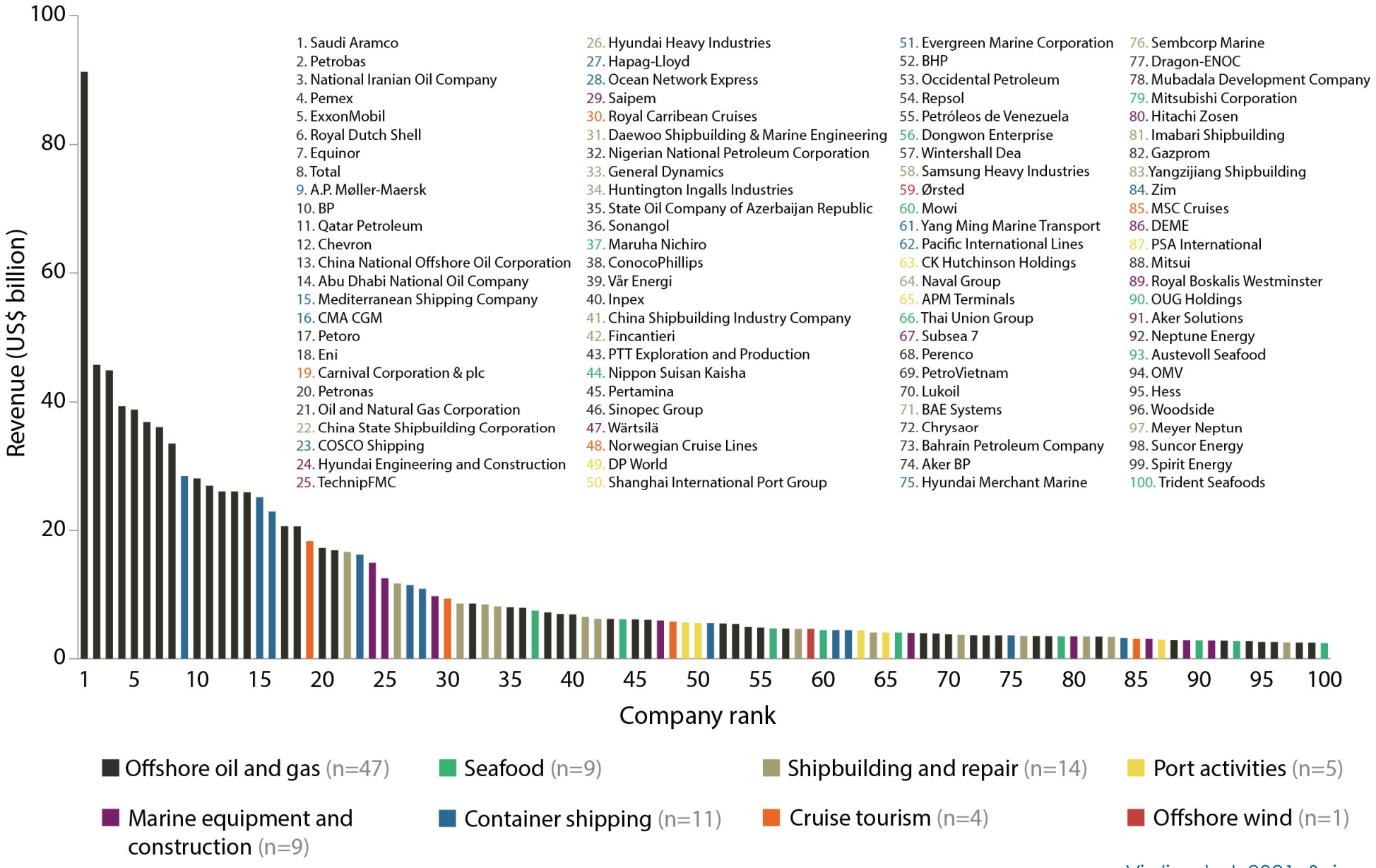




Transnational corporations in the ocean economy

The **top 10** firms typically make up over half of that industry's revenues

Virdin et al. 2021, *Science Advance*



Virdin et al. 2021, *Science Advances*

Study design overview

- 15 largest corporations (measured by 2024 turnover figures) …
- In eight ocean industries, namely
  - shipping; cruise tourism; marine equipment & construction; offshore wind; offshore oil & gas; port operations, fishing/seafood; shipbuilding & repair …
- Registered in 31 countries, with global operations, impacts & potential
- In addition, will produce guidance for Ocean Hub locations & corporations (via UNGC collaboration)

- Three foundational assumptions
  - Reporting matters for behaviour & industry norms
  - Reporting needs customisation to support uptake
  - Keystone actor cohorts can effect change (alongside other stakeholders)
- Three elements support toolkit development, namely, to understand the:
  - communities, employees & due diligence elements that contribute to safer ocean industries;
  - governance requirements associated with these topics; &
  - what corporate reporting exists that addresses these aspects.

Focusing on customised toolkit development that is meaningful for stakeholders

Six evidence streams

Element	Rationale for evidence element
1. Academic focused literature reviews for community, workers & due diligence.	To establish the knowledge base of what is known via peer review processes & have been subject to investigation.
2. Review of corporate governance requirements in cohort countries (& those of Ocean Hub locations) incorporating financial & non-financial reporting.	To establish the requirements & expectations for information provision by corporate actors.
3. Review of corporate reporting practices.	To establish what is already widespread & competent practice.
4. Review of international agreements that related to issues & their adoption in cohort countries.	To identify potential sources of governance across issues of salience (including sector specific agreements).
5. Stakeholder mapping & resource identification.	To establish who may already be acting in this space and generating resources for companies.
6. Stakeholder engagement for toolkit design & proofing.	To ensure the useability of toolkits ahead of their finalisation.

Worker review: methodology and search terms

Scopus and Web of Science · English · 2000–2025 · Eight industries

Searches: July–September 2026

Search strategy

Worker terms AND impact terms AND industry terms where applicable

Shortened example

("seafarer" OR "ship crew")
AND ("fatigue" OR "mental health")

Impact terms cover safety, wellbeing, labour rights, exploitation, job quality, equality and social sustainability.

Industry blocks and Web of Science terms were adapted during search development.

Selection process in Rayyan

2,677	Records identified
174	Duplicates removed
2,503	Titles and abstracts screened
518	Reports assessed in full text
476	Included after full-text screening

Community review: methodology and search terms

Scopus and Web of Science · English · 2000–2025 · Eight industries

Searches: June– August 2026

Search strategy

Community terms AND industry terms

Shortened example

("coastal community" OR "Indigenous")
AND ("offshore wind" OR "offshore wind farm")

Community terms cover definitions, affected groups, engagement, participation, rights, social impacts and governance.

Three initial term groups were tested, combined and refined with research-team feedback.

Selection process in Rayyan

13,528	Records identified
3,964	Duplicates removed
9,564	Titles and abstracts screened
1,135	Reports retained for full-text assessment
Pending	Final full-text inclusion counts

Exclude non-human “communities” and technical material without a social or governance dimension.

Impacts of ocean industries on workers and community summary

WORKERS

Health and safety
Accidents, exposure and physical strain, with both immediate and long-term consequences.

Work organisation
Hours, shifts, fatigue, isolation and recovery affect wellbeing and safe performance.

Employment and power
Precarity, migrant vulnerability, exploitation, harassment and voice vary across sectors.

Uneven evidence
The reviews cover some industries far more extensively than others.

COMMUNITIES

Livelihoods and local benefits
Jobs, business, food and connectivity coexist with dependence and disrupted livelihoods.

Marine space and health
Access restrictions, pollution and industrial development affect different groups unequally.

Culture, wellbeing and rights
Identity, mental health, cohesion, customary rights and participation matter alongside income.

Different relationships with industry
Communities may live alongside activity, depend on it, compete with it or form part of it.

Two examples of how this plays out for specific ocean industry sectors (the eight sectors have been characterised)

Cruise Tourism

WORKER IMPACTS

Living and working aboard

Long contracts and close social/ work life cause strain. Social relationships can also be supportive within the work environment.

Job quality and insecurity

Precarity, differences between officer and non-officer roles, and pandemic job loss cause mass unemployment.

Gendered power and harassment

Female workers report sexual harassment, unequal power and sexual-health concerns.

Incidents and confinement

Severe accidents and pandemic confinement can harm physical and psychological health.

COMMUNITY IMPACTS

Spending and employment

Visitor expenditure supports businesses and livelihoods, but benefits can be uneven and seasonal.

Crowding and service pressure

Visitor peaks strain transport, waste systems and infrastructure and can reduce liveability.

Culture and autonomy

Tourism reshapes heritage, identity and resident–visitor relationships, including Indigenous autonomy.

Health and resident wellbeing

Pollution, infectious-disease risks and tourism-related stress sit alongside opposition and conflict.

Port Operations

WORKER IMPACTS

Physical workload

Manual handling and awkward postures create back, neck and shoulder problems.

Airborne exposure

Fumes, dust and cargo-related substances link to respiratory problems and occupational allergy.

Safety-critical tasks

Cargo operations bring injury risks. Traffic-management work brings stress and fatigue.

Changing employment

Automation and restructuring alter skills, jobs and union power, with gender barriers to entry.

COMMUNITY IMPACTS

Health near port infrastructure

Air pollution, noise and contaminated water or soil affect surrounding neighbourhoods.

Expansion and displacement

Land and marine-space demands can displace residents, restrict coastal access and disrupt fishing.

Unequal burdens and influence

Marginalised communities can face disproportionate exposure and limited influence over planning.

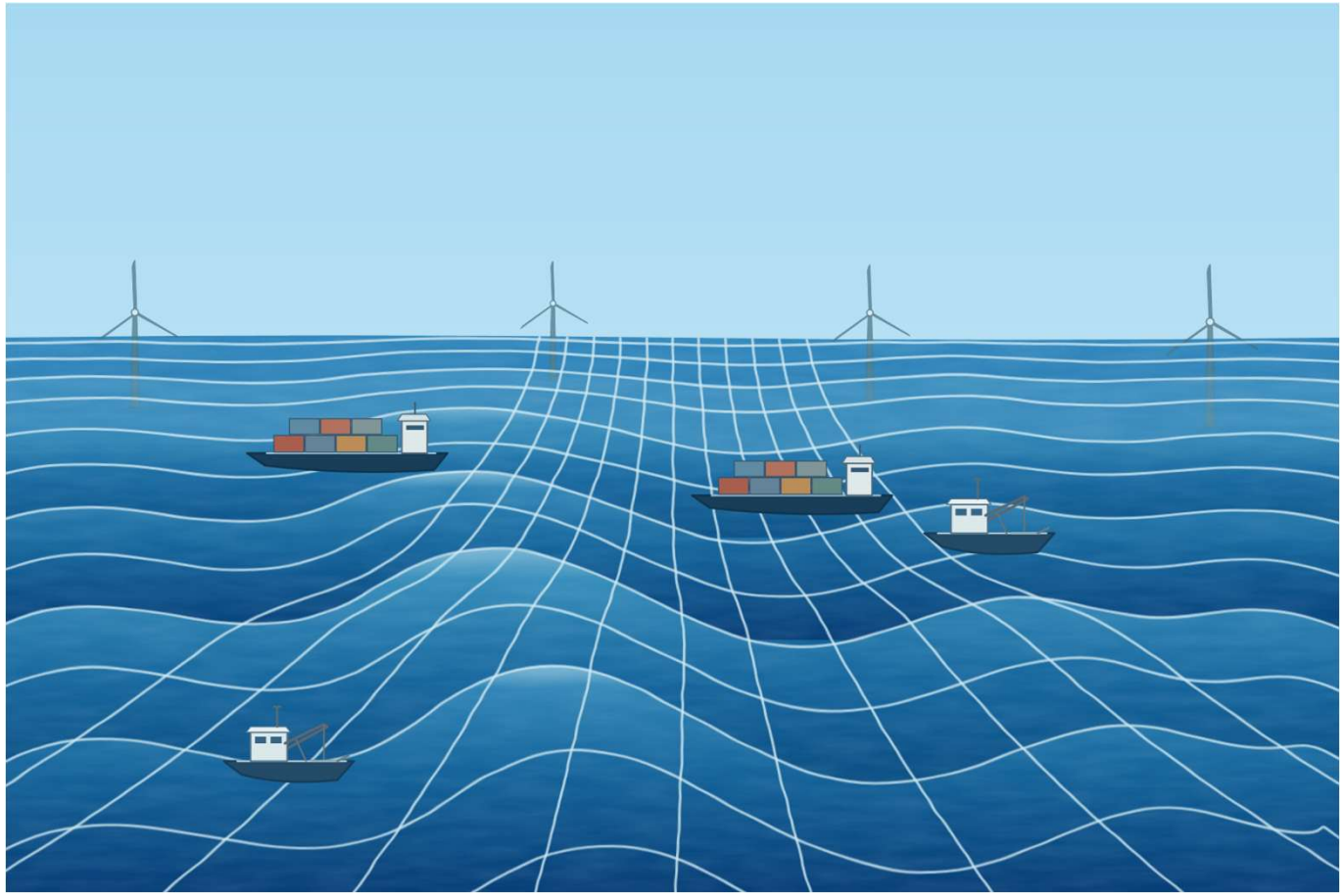
Economic and urban benefits

Jobs, tourism, business activity and waterfront regeneration coexist with disaster vulnerability.

Six evidence streams

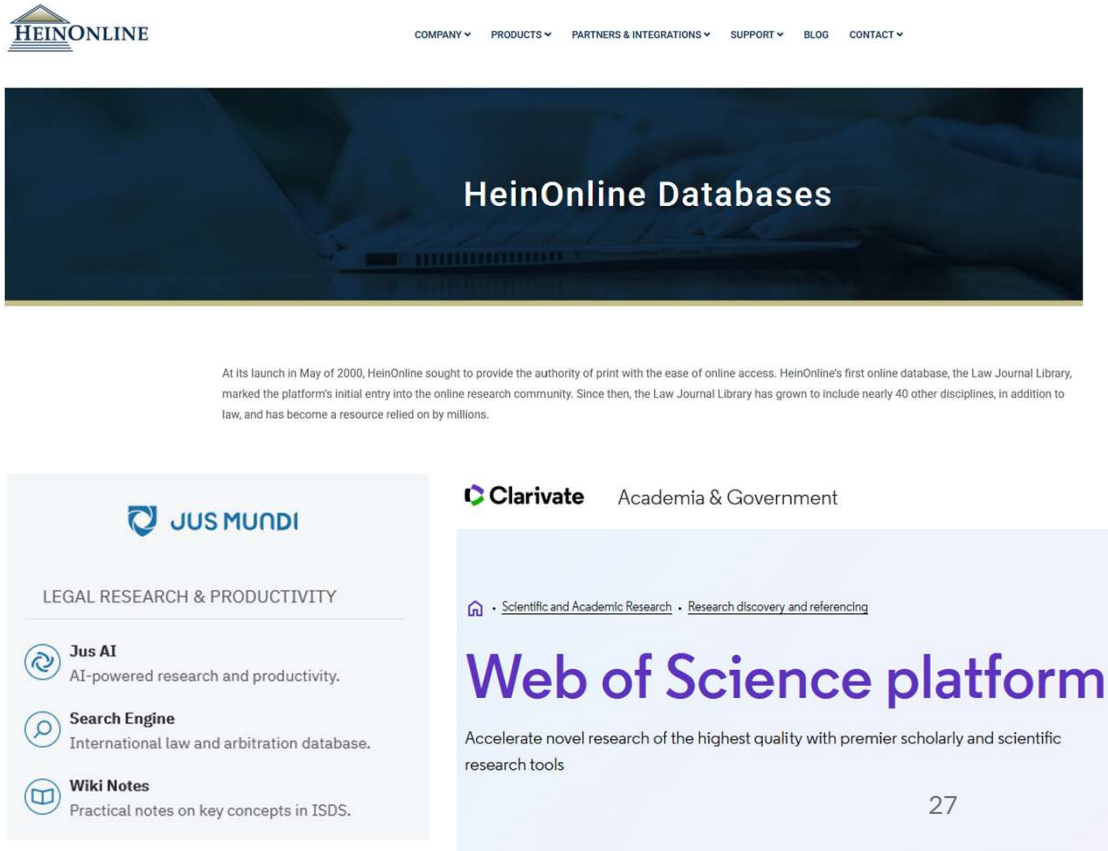
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The unseen matrix of rules and norms governing ocean use and social impacts

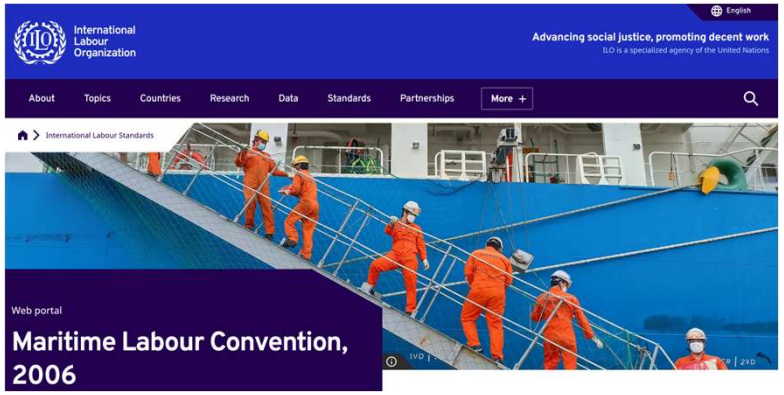


The landscape of international agreements

- Two parallel approaches to identify relevant agreements
  - ***Governing ocean use & conservation*** (worker and community impacts within core ocean-based industries & the agreements that aim to address these)
  - ***Regulating specific social impacts*** (cross cutting impacts on workers across industries, coastal communities)
- Keyword searches within 3 sources
- Creating a database of agreements:
  - Binding / non-binding agreements
  - Applies to states or corporations
  - Industry-specific or cross-industry
  - Applies to workers, communities, or outside-ocean economy supply chain due diligence



Example of ocean agreements affecting specific maritime industries



ILO Maritime Labour Convention 2006

- "Seafarers' Bill of Rights"
- Applies to offshore *mobile* drilling units
- Multi-industry | Applies to workers | Legally binding
- Applies to sovereign States that choose to ratify it
  - Flag States: Ratifying countries are legally obligated to write the MLC rules into national laws. They must then enforce these laws on all ships flying their flag.
  - Port States: Ratifying countries are also bound to inspect foreign-flagged ships that enter their ports. Under the "no more favorable treatment" clause, port states must enforce MLC standards even on ships from countries that haven't ratified the treaty.
- Applies to legal entities indirectly through national law
  - The "Shipowner" Liability: The MLC specifically defines the "shipowner" as the legal entity responsible for compliance. This can be the actual owner, the manager, or the bareboat charterer.
  - Domestic Enforcement: Because ratifying States turn the MLC into domestic legislation, legal entities are bound by their country's maritime and labor laws.
  - Consequences: If a shipping company (legal entity) violates MLC standards, it faces direct legal penalties from the State. This includes fines, legal prosecution, or having their vessels detained in port, which can cause massive financial losses.

Example of an applicable agreement focused on social impacts



ICESCR 1966

- Economic and labor rights
- Just working conditions
- Trade union rights
- Multi-sectoral | Applies to workers | Legally binding
- Applies to sovereign States that choose to ratify it
  - Actions: legislate domestically, report to UN Committee, and agree to review
  - Implementation: instantly ban actions contrary to the agreement; implement conditions over time considering budgets, etc…
- Applies to legal entities indirectly through national law
  - Codify or update national labor codes, minimum wage laws, corporate safety regulations, and environmental standards
  - Ensures compliance & sets enforcement structure, fines & penalties

Six evidence streams

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The reporting analysis: aligning the issues, the law, & what companies report

Aspect	Gap analysis
Issues: what harms workers, communities (own operations & in supply chains)	**Regulatory gap:** issues matter but no law asked for corporate disclosure about them
Regulation: what the law requires companies to report on (& to do)	**Compliance gap:** law asks for disclosure but there is a lack of reporting
Corporate reporting: what the 120 cohort companies disclose (in any reporting format)	**Transparency gap:** lack of reporting means that stakeholders can engage companies on these issues

Closing these gaps is the route to transparency & better accountability. The reporting matrix is the middle piece: without it, we cannot distinguish a missing disclosure from a missing rule.

Mapping corporate governance requirements

- 120 corporations
- 31 countries of incorporation
- 558 specific rules in force
- Synthesised in 126 common categories

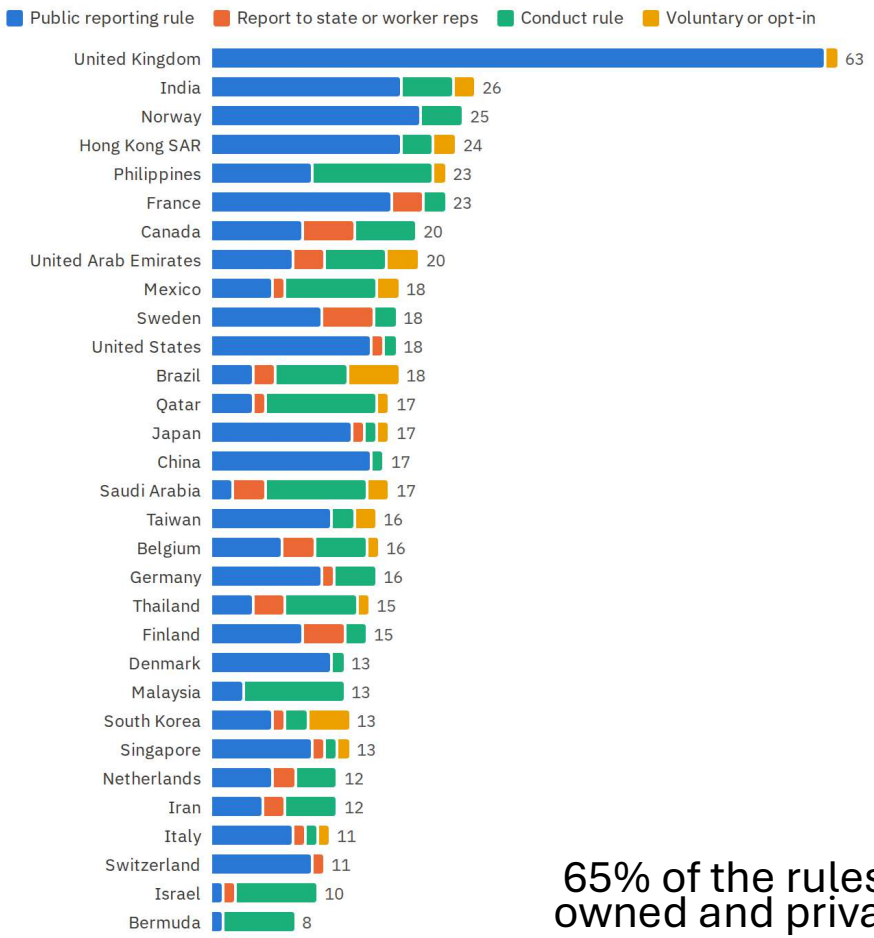
For each of the 31 jurisdictions we recorded every rule that governs these companies on workers, affected communities and value chains, plus non-financial reporting frameworks. Every rule records the instrument, its legal force, who it applies to, and what to look for in a company report.

UK example in next slide (63 elements from Companies Act to the Modern Slavery Act)

Each row of the matrix is one rule a company report can be checked against

	B	C	D	E	F	G	H	I	J
1	Social pillar	Regulation	Issuing body	Year	Legal or guidance reference	Mandatory status	Applies to	Verifiable disclosure point	What to look for when coding a company report
2	Workers and employees	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(8)(c)	Mandatory	Quoted companies	The report gives the number of persons of each sex who were directors at the end of the financial year.	A male and female count of directors of the company or, for a group report, the parent company.
3	Workers and employees	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(8)(c)	Mandatory	Quoted companies	The report gives the number of persons of each sex who were senior managers.	A male and female count of senior managers, meaning those responsible for planning, directing or controlling a significant part of the business, including directors of subsidiaries in a group report.
4	Workers and employees	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(8)(c)	Mandatory	Quoted companies	The report gives the number of persons of each sex who were employees.	A male and female count of all employees, or of all undertakings in the consolidation for a group report.
5	Communities	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(7)(b)(iii)	Mandatory to the extent necessary for an understanding of the business	Quoted companies	The report gives information about community issues.	Narrative on the company's effect on local or wider communities.
6	Communities	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(7)(b)(iii)	Mandatory to the extent necessary for an understanding of the business	Quoted companies	The report gives information about social issues.	Narrative on social matters connected to the business.
7	Communities	Companies Act 2006 strategic report	UK Parliament and Financial Reporting Council	2006	Section 414C(7)	Mandatory to the extent necessary for an understanding of the business	Quoted companies	The report describes the policies on social, community and human rights matters and the effectiveness of those policies.	Named policies plus a statement of whether they are working.
8	Supply chain due diligence	Companies Act 2006 Section 172(1) statement	UK Parliament	2018	Section 414CZA(1) and section 172(1)(c)	Mandatory	Companies required to prepare a section 172(1) statement because they do not qualify as medium-sized. Under the current Companies Act thresholds, a company is medium-sized only if it satisfies at least two of: turnover not more than £54 million, balance-sheet total not more than £27 million, and not more than 250 employees, subject to the statutory two-year rules and group provisions.	The Section 172 statement explains how the directors had regard to the need to foster the company's business relationships with suppliers, customers and others.	A passage on supplier and other business relationships, ideally tied to a decision taken in the year.
9	Supply chain due diligence	Companies Act 2006 Non-Financial and Sustainability Information Statement	UK Parliament	2016	Section 414CB(2)(d)	Mandatory where relevant and proportionate	Companies within section 414CA: broadly traded companies, banking companies, authorised insurance companies and companies carrying on insurance market activity that exceed the section's 500-employee condition, subject to the group and exemption provisions. The 2022 climate-reporting expansion in section 414CB(2A) reaches additional large companies for climate disclosures only; it does not extend the employee/social/human-rights matters in section 414CB(1).	The statement describes the business relationships, products and services likely to cause adverse impacts on social matters, employees or human rights, and how the company manages those risks.	Identification of where in relationships, products or services harm is most likely, and the response. This is the supply chain limb of section 414CB(2)(d).
10	Supply chain due diligence	Modern Slavery Act 2015 section 54	UK Parliament and Home Office	2015	Section 54(1) and 54(4)	Mandatory to publish	Commercial organisations carrying on business in the United Kingdom with total turnover of at least 36 million pounds	An annual modern slavery and human trafficking statement is published for the financial year.	A dated statement covering the financial year, covering both own operations and supply chains.

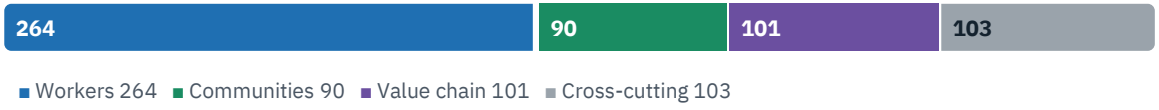
What is in the matrix?



By type of rule: 62% public reporting, 25% conduct, 8% to state or workers



By issue element



By legal force: 85% mandatory, 9% comply-or-explain



65% of the rules also apply to unlisted companies: this matters for the state-owned and private companies in the cohort. Each company is read against its own law, not a generic list.

Six evidence streams

Element	Rationale for evidence element
1. Academic focused literature reviews for community, workers & due diligence.	To establish the knowledge base of what is known via peer review processes & have been subject to investigation.
2. Review of corporate governance requirements in cohort countries (& those of Ocean Hub locations) incorporating financial & non-financial reporting.	To establish the requirements & expectations for actions & the information provision by corporate actors.
3. Review of corporate reporting practices.	To establish what is already widespread & competent practice.
4. Review of international agreements that related to issues & their adoption in cohort countries.	To identify potential sources of governance across issues of salience (including sector specific agreements).
5. Stakeholder mapping & resource identification.	To establish who may already be acting in this space and generating resources for companies.
6. Stakeholder engagement for toolkit design & proofing.	To ensure the useability of toolkits ahead of their finalisation.

Disclosure survey design

Kind of report	What it is
Annual report	The yearly report to shareholders, also US 10-K and 20-F
Separate sustainability report	A report only on environmental, social and governance topics (ESG or CSR report)
Other documents	Mostly modern slavery statements and climate reports

Example rule (UK Companies Act): requires the number of directors by gender.

Evaluating quality of disclosure

Score	Meaning	Example
2	Specific: gives what the rule asks for	“7 men and 4 women on the board”
1	General: talks about the topic, not complete	“We support gender diversity”, no count
0	Absent: does not give the information	Nothing on board gender
N/A	Not applicable: the rule does not apply to this firm	The firm is not a quoted company

Every score comes with the quote and the page number, so anybody can check it.

Outputs from the analysis

Firms	All 120 firms in the cohort
Documents	All public documents for 2024
Scores	Every rule for every firm
Evidence	A quote and a page for each label of specific or general

1. We read each report in full, in its original language
2. A computer checks that every quote is on its page
3. People check a random sample of scores
4. We report the error rate with the results

Typology of reporting

	Found in public reports	Not found in public reports
Required by home rules	Reported as required Danish shipping firm: diversity policy, target and result, page 115	No evidence found
Not required	Voluntary reporting Swiss shipping firm: fatalities by worker group, pages 54 and 61	No home rule asks for it Swiss shipping firm: board gender

This is the basis from which we will develop reporting toolkits for each country & sector (identifying if it is a lack of guidance or an inability to translate guidance into industry settings)

Closing points

- Next steps in the work programme
  - Complete academic literature review
  - Non-financial reporting review
  - ‘Heat’ map of disclosure requirements across countries
  - Ocean Centre programme of work
  - Gathering insight from the ‘grey’ literature
  - Identify and build stakeholder coalition
  - Engaging with companies and sector bodies (after the first round of corporate disclosure analysis)
  - Toolkit development & testing
- Project finishes March 2028
- We will be providing details on the work programme as we go
- Stakeholder identification has started (for proofing academic insights, partners for developing tool kits & advice on how to ensure user uptake): we hope you take our call



Thanks for listening

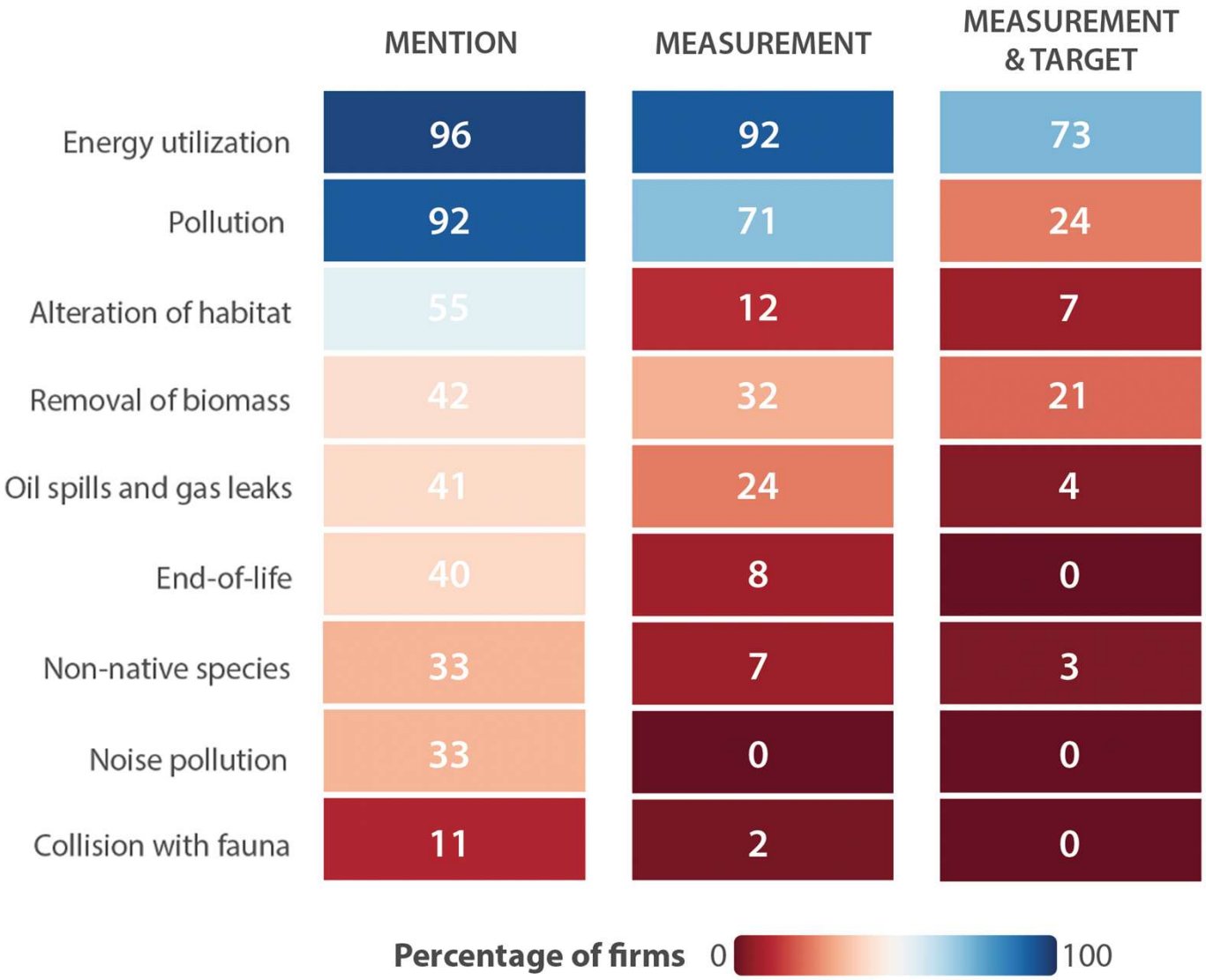
We know there is a great deal to ‘take in’

Questions?

Contact: j.bebbington1@lancaster.ac.uk

Website: https://www.lancaster.ac.uk/pentland/activities/hubs/people-and-the-ocean/c4safe/

Backup slides



Jouffray et al. 2025, *Nature Sustainability*

With the exception of GHG emissions, few firms measure ocean environmental impacts and even fewer disclose a target

Shipping

WORKER IMPACTS

Mental health and isolation

Stress, anxiety and loneliness link to prolonged time aboard and separation from home.

Fatigue and safety

Watches, long hours and insufficient recovery disrupt sleep and reduce alertness.

Physical health

Injury, hazardous exposure, musculoskeletal strain and constrained food choices affect health.

Employment and power

Precarity, harassment and discrimination sit alongside barriers to healthcare and worker voice.

COMMUNITY IMPACTS

Pollution and health

Emissions affect coastal and port residents. Spills add toxic exposure and recovery burdens.

Livelihoods and access

Shipping and spills can disrupt fishing, hunting, harvesting and tourism income.

Culture and wellbeing

Indigenous marine practices, family relationships and mental wellbeing can be affected.

Connectivity and resilience

Transport supports goods, services and local economies. Disruption exposes dependence on shipping.

Marine Construction

WORKER IMPACTS

No retained worker-impact papers

The review found zero relevant papers after screening.

Meaning of the gap

It does not demonstrate that workers face no impacts, but there is a gap in the literature and possible evidence

COMMUNITY IMPACTS

Fishing and local economies

Dredging, reclamation and closures affect fishing activity, access and income.

Contaminants and health

Disturbed sediments and dredged-material disposal can create exposure and quality-of-life concerns.

Competing interests and trust

Decisions about dredging and marine space can generate conflict. Participation affects collaboration and social capital.

Breadth of evidence

Evidence mainly concerns dredging and coastal engineering, with limited cable-related evidence and some water-use cases.

Offshore Wind

WORKER IMPACTS

Sleep quality

Workers report poorer sleep offshore and difficulties falling or staying asleep.

Living and environmental conditions

Noise, vibration, air quality and shared cabins are associated with sleep problems.

Recovery

The offshore working environment creates recovery needs, with sleep relevant to health and safety.

COMMUNITY IMPACTS

Fishing and coexistence

Changes to fishing grounds, access, effort, costs and navigation can disrupt livelihoods.

Seascapes and identity

Visibility and altered coastal views affect place attachment, heritage and recreation.

Voice, rights and fairness

Consultation, Indigenous marine rights and the distribution of benefits influence conflict and acceptance.

Energy and regional opportunities

Jobs, local supply chains, investment and community benefits accompany renewable-energy provision.

Offshore Oil and Gas

WORKER IMPACTS

Rotations, fatigue and sleep

Long and rotating shifts affect recovery, vigilance and safety-critical performance.

Stress and mental health

Remote work and confinement can contribute to distress, anxiety and depression.

Cumulative exposure

Benzene, other chemicals, noise and physical strain link to disease and long-term health risks.

Emergency and work-eligibility risks

Accidents, helicopter travel and evacuation pose hazards. Ill health can end eligibility to work offshore.

COMMUNITY IMPACTS

Fishing and marine access

Development competes with existing users and can disrupt grounds, catches, income and customary use.

Spills and recovery

Pollution and accidents affect health, livelihoods, mental wellbeing and community cohesion.

Justice and participation

Unequal burdens, compensation, Indigenous rights and influence over decisions shape community outcomes.

Fishing and Seafood

WORKER IMPACTS

Injury and fatality risks

Vessels, gear, machinery and sea conditions create serious accident and drowning hazards.

Workload and occupational health

Irregular hours, fatigue, heavy work and repetitive processing tasks affect physical and mental health.

Hazardous exposure

Chemicals, biological agents, noise, heat and weather add occupational-health risks.

Employment and exploitation

Low or insecure income, migrant vulnerability, forced labour, violence and weak protections feature in the evidence.

COMMUNITY IMPACTS

Livelihoods and food security

Fisheries sustain income, nutrition and local economies. Stock and market changes can affect household security.

Access and governance

Resource rights and co-management and market access shape who can fish and capture benefits.

Culture and resilience

Customary knowledge, Indigenous food systems and fishing identities connect ecosystems with community wellbeing.

Shipbuilding and Repair

WORKER IMPACTS

Fumes, chemicals and disease

Welding fumes, metals, paints and solvents link to respiratory and other occupational illness.

Long-latency health effects

Asbestos and carcinogenic exposures can cause cancers and disease many years after employment.

Physical and operational hazards

Musculoskeletal strain, accidents, noise, vibration and confined-space work create multiple risks.

Psychosocial and employment impacts

Stress, burnout and sickness absence affect workers. Some research also identifies labour trafficking within the industry.

COMMUNITY IMPACTS

Pollution beyond the workplace

Contaminants from shipyards and recycling sites can expose nearby residents and affect public health.

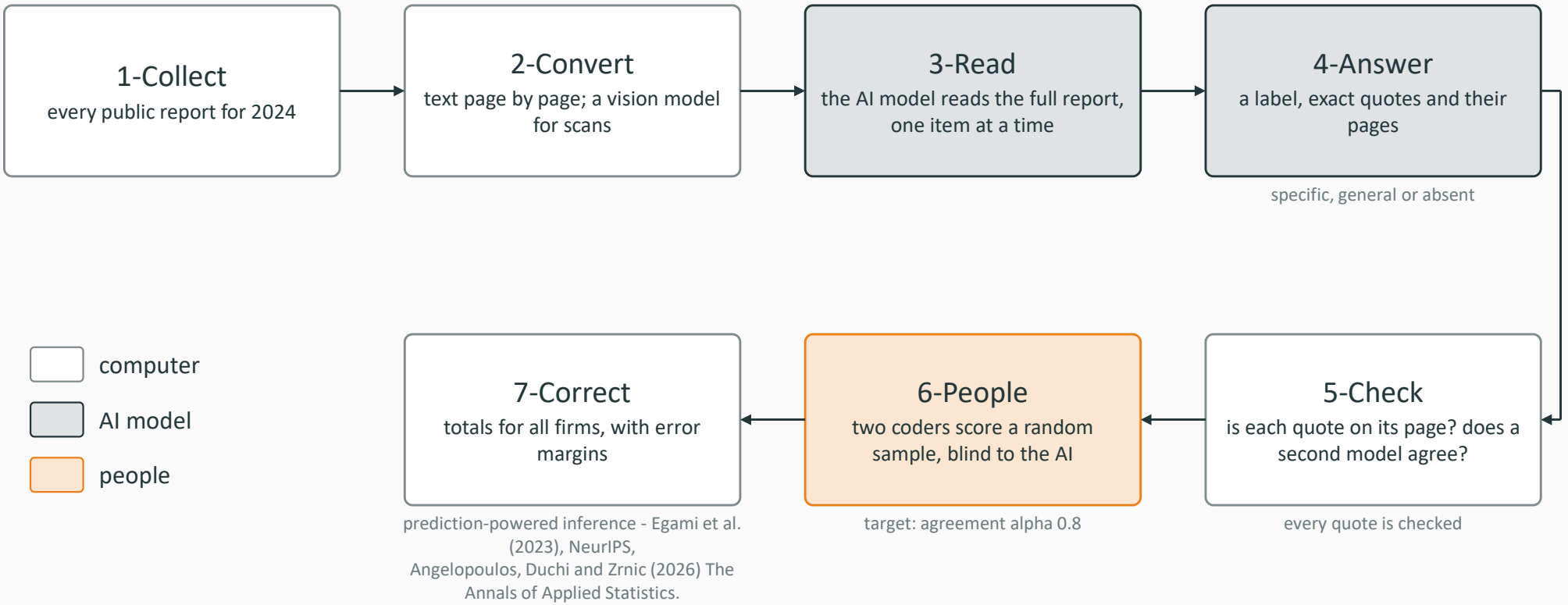
Jobs, closure and insecurity

Employment supports households. Closure and industrial decline can undermine income and social cohesion.

Legacy pollution and inequality

Redevelopment, displacement, and unequal exposure raise environmental justice questions.

The pipeline at a glance (using LLM for reading, with human checks)



The AI model does steps 3 and 4. Computers and people check its work.

Why we use AI to read company reports?

AI does well	Study
Agree with expert coders as often as experts agree with each other (89–91% on easy coding tasks, 69–76% on hard ones). An older model fell behind (78% and 57%).	(Nakamura, Tan and Yean 2026, arXiv)
Numbers in sustainability statements match expert values (adjusted R^2 0.93)	(Forster et al. 2026, Nature communication)
Modern slavery statements: found 94% of what experts found	(Gad et al. 2026 IJCAI)
Search alone often misses the right passages	Schimanski et al. (2024) EMNLP, ClimRetrieve

What the model sees and gives back

It sees

- The full report as text, with a marker before each page:

```
[Page 117]
Fatalities in 2024 Number 1 (4)
Regrettably, we had one fatal ...
[Page 118]
```

- One item: work-related fatalities.
  - Specific: the number for the year.
  - General: fatalities, but no number.
  - Absent: nothing.
- Rules: use only this report; copy quotes word for word; take the page from the marker.

It gives back

```
{"label": "specific",
 "quotes": [
  {"page": 117,
   "text": "Fatalities in 2024 Number 1
     (4) Regrettably, we had one fatal
     incident involving a contracted
     colleague ..."},
  {"page": 125,
   "text": "Fatalities Number 1"}],
 "reason": "The report explicitly
   discloses the number of work-related
   fatalities for the year 2024 ..."}
```

Real output for the Danish shipping firm, Gemini 3.8 Flash, 14 October 2026. The model reads all 204 pages for each question.

Every score can be checked

Firm	Danish shipping firm
Item	Work-related fatalities (spine)
Label	Specific (2)
Quote	“Regrettably, we had one fatal incident involving a contracted colleague in a warehouse in the Philippines on 26 December 2024.”
Page	117, Annual Report 2024
Quote check	Pass: quote found on page 117
Second model	Same label

1. The AI model must quote the report and give the page
2. A computer checks that the quote is on that page
3. A second model scores again
4. People check a random sample

A true quote and a second model that agrees do not prove that the label is right. That is why people check a sample.

Real output from the live test, Gemini 3.8 Flash, 14 October 2026.

How we measure and correct the error

People check a random sample

- Two coders, blind to the AI score
- Agreement between coders: Krippendorff's alpha 0.8 or more
- Found rate: the share of the coders' quotes that the AI also found

Then we correct the totals

- AI labels for all cells, people for a random sample
- Prediction-powered inference gives valid error margins
- Unsure cells are more likely to go to people. This needs fewer human labels.
- We log the model, version, date and prompt of every run

Krippendorff 2004; Törnberg 2024; Angelopoulos et al. 2023/2026; Egami et al. 2023; Gligorić et al. 2025; Ludwig et al. 2026; Feuerriegel et al. 2026



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