Pardo's legacy:
Will Science Push the Limits of UNCLOS?

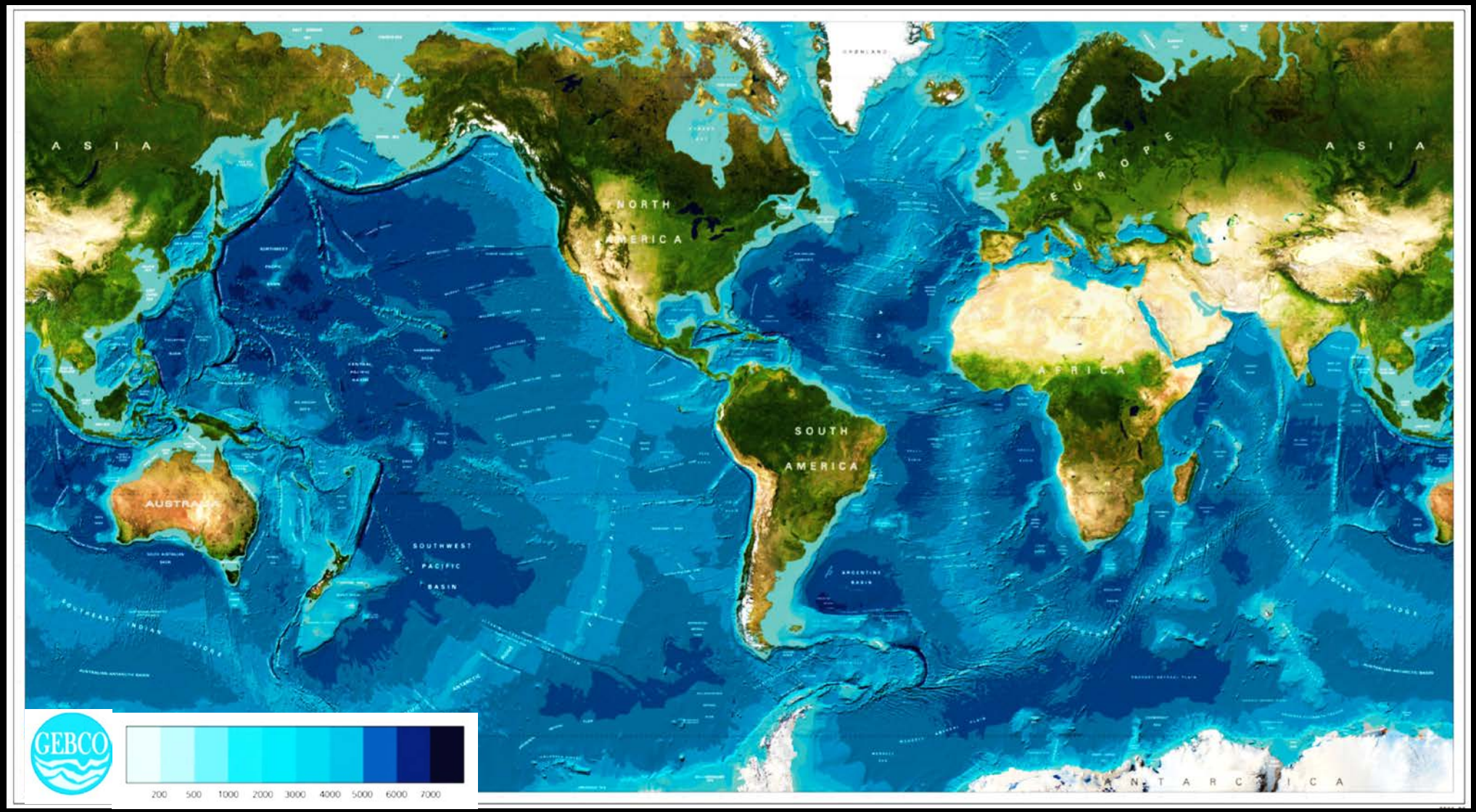
Pushing the Limits of UNCLOS

ABLOS, Monaco,

10-11 October, 2017

Kristina M. Gjerde
Senior High Seas Advisor, IUCN
Co-lead Deep Ocean Stewardship Initiative
Honorary Fellow, University of Edinburgh School of Geosciences
Adjunct Professor, Middlebury Institute of International Studies at Monterey, California

Case study on the deep seabed Area

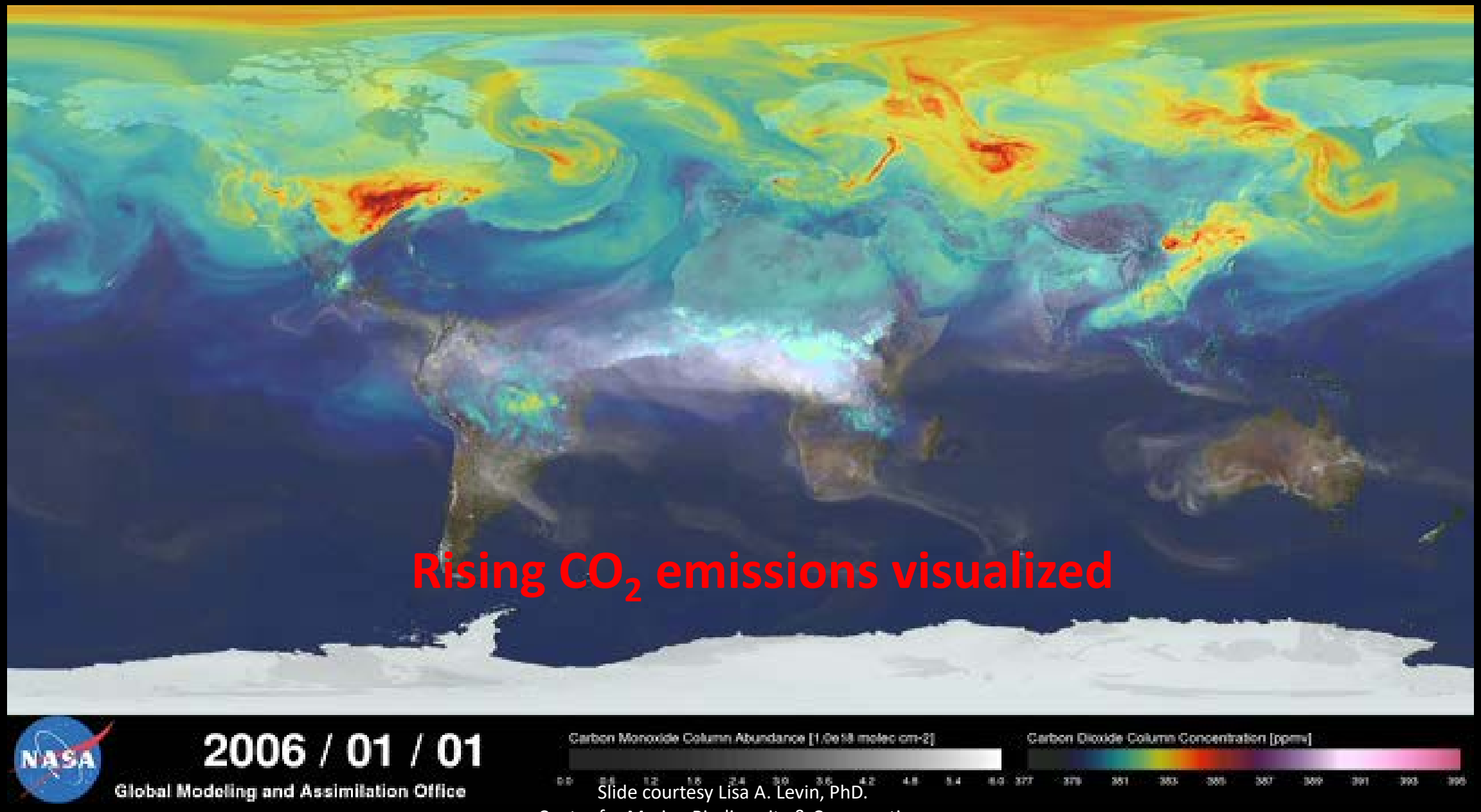


98% of the ocean's volume is > 200m deep

Increasing challenges to the global ocean: defaunation, industrialization and degradation

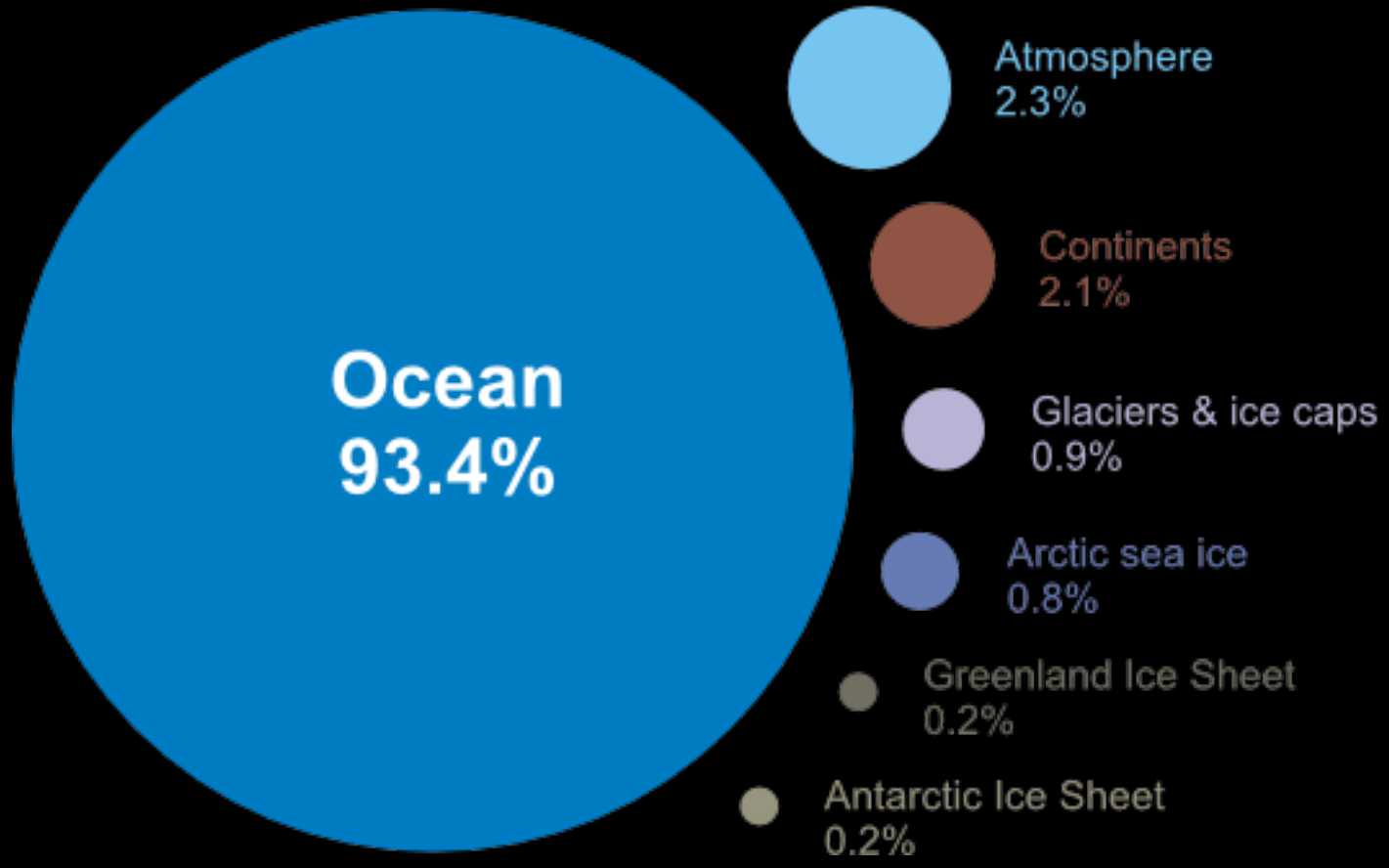
D J McCauley et al. Marine defaunation: Animal loss in the global ocean, SCIENCE
14 January 2015

Science
AAAS



Slide courtesy Lisa A. Levin, PhD.
Center for Marine Biodiversity & Conservation,
Scripps Institution of Oceanography, La Jolla, CA

Where is global warming going?



OCEAN AND CLIMATE, 2015 – *Scientific Notes.* www.ocean-climate.org, 116 pages.

Relevance of scientific advances to fundamental premises of UNCLOS

- Case study on deep sea mining in the Area
  - Legacy of Arvid Pardo
  - Key UNCLOS provisions
  - Fast forward 50 years
  - Evolving mining regulations
- Implications for the future

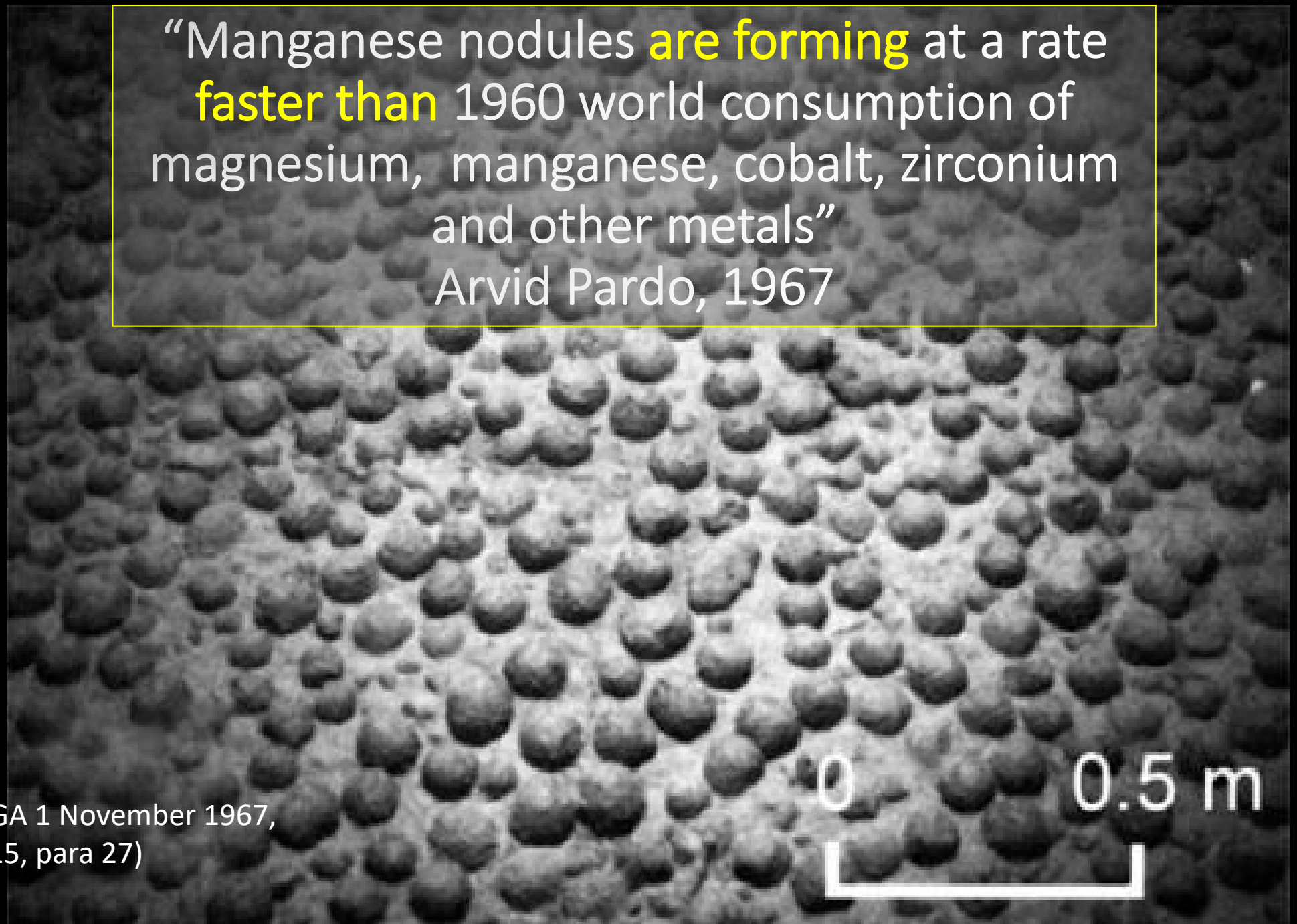
A new concept for the deep seabed:
Common Heritage of Mankind

"Race to be the first to possess ocean floor resources should give way to an international authority to oversee development of this shared resource."

Arvid Pardo, Ambassador of Malta, November 1967

Amb. Arvid Pardo,

http://legal.un.org/avl/ha/uncls/uncls.html

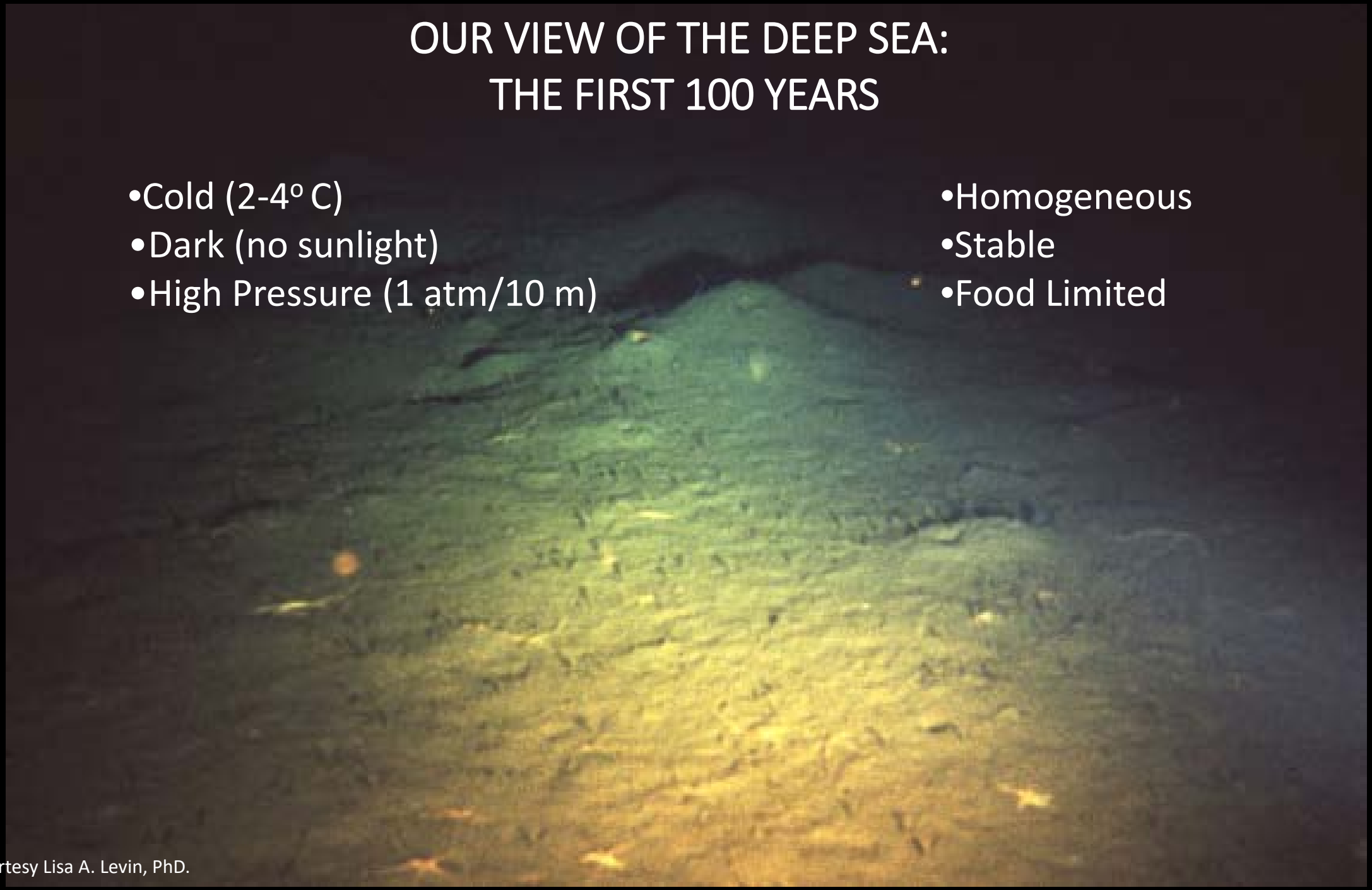


"Manganese nodules are forming at a rate faster than 1960 world consumption of magnesium, manganese, cobalt, zirconium and other metals"
Arvid Pardo, 1967

Speech to UNGA 1 November 1967,
(A/C.1/P.V, 1515, para 27)

OUR VIEW OF THE DEEP SEA: THE FIRST 100 YEARS

- Cold (2-4^{o} C)
- Dark (no sunlight)
- High Pressure (1 atm/10 m)
- Homogeneous
- Stable
- Food Limited



Slide courtesy Lisa A. Levin, PhD.

1982 United Nations Convention on the Law of the Sea (UNCLOS) Part XI

"The Area and its resources are the Common Heritage of Mankind"

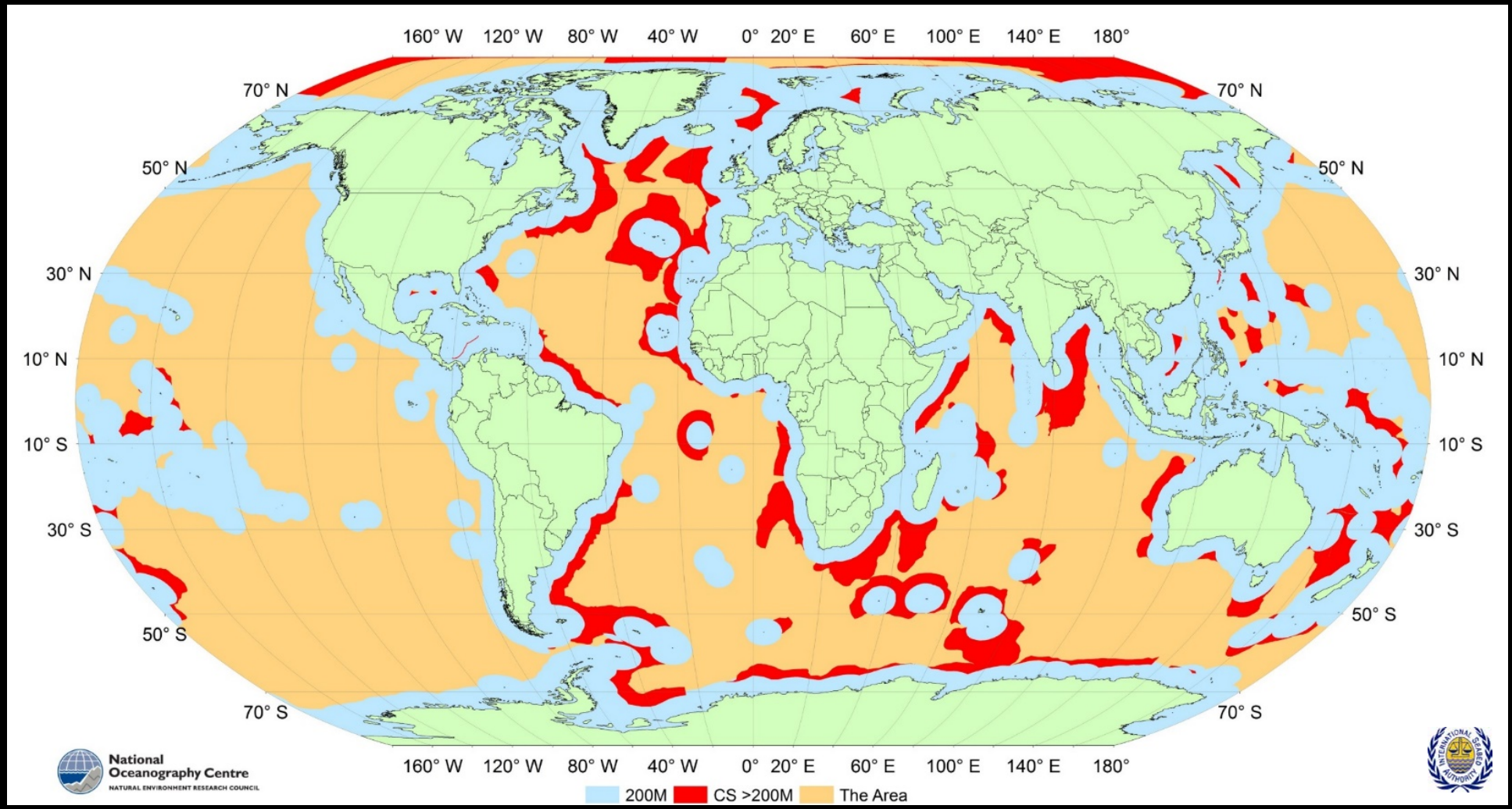
The

UNCLOS 1982: A new map of the ocean

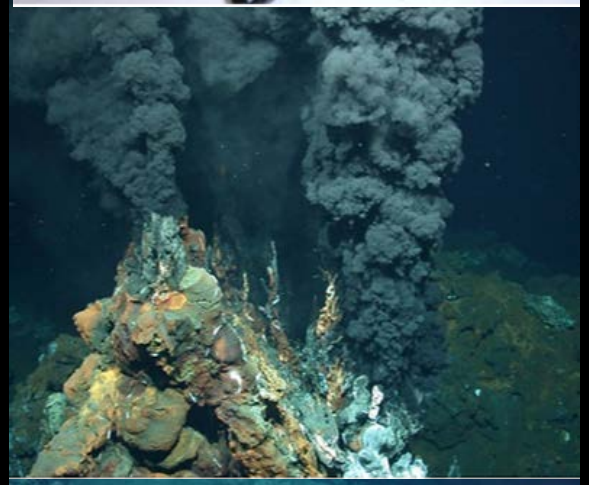
Exclusive Economic Zones

Extended continental shelf

International seabed Area



Map courtesy Michael Lodge, ISA



Art. 133 “The Area and its resources are the Common Heritage of Mankind”

- No sovereignty
- Rights vested in humankind
- Common management & regulation
- Peaceful purposes

Art. 137: “For the benefit of mankind as a whole”

- Benefit sharing: economic
- Benefit sharing: capacity development
- Marine scientific research
- Effective protection from harmful effects

UNCLOS Art. 145: Necessary measures shall be taken …..to ensure *"effective protection"* from "*harmful effects"…*

To this end the Authority shall adopt appropriate rules, regulations and procedures for *inter alia*:

© Lily Simonson

(a) the **prevention, reduction and control** of **pollution** and other hazards to the marine environment, including the coastline, and **of interference with the ecological balance** of the marine environment, particular attention being paid to the **need for protection from harmful effects** of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities;

(b) the protection and conservation of the **natural resources** of the Area and the **prevention of damage** to the flora and fauna of the marine environment.

Article 150: Policies relating to activities in the Area

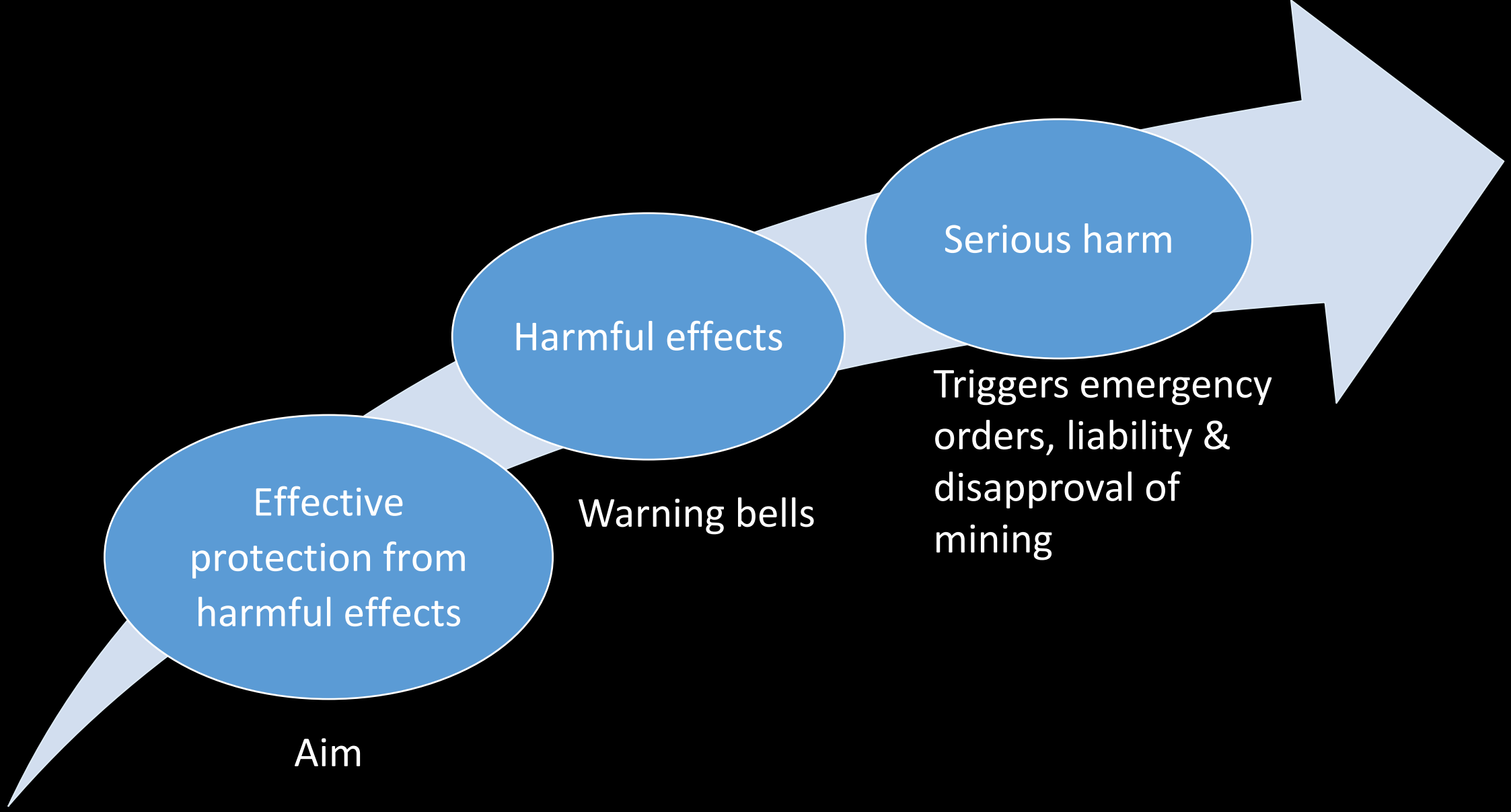
Activities in the Area shall, as specifically provided for in this Part, be carried out…

so as to foster healthy development of the world economy … and with a view to ensuring:

- (a) the development of the resources of the Area;

Article 162: Mining to avoid “serious harm”

1. The Council can issue emergency orders to prevent serious harm (162.2(w))
2. The Council can disapprove areas for exploitation … where substantial evidence indicates a risk of serious harm (162.2 (x))
3. A court or tribunal may prescribe provisional measures, *inter alia*, to prevent serious harm to the marine environment (290.1).

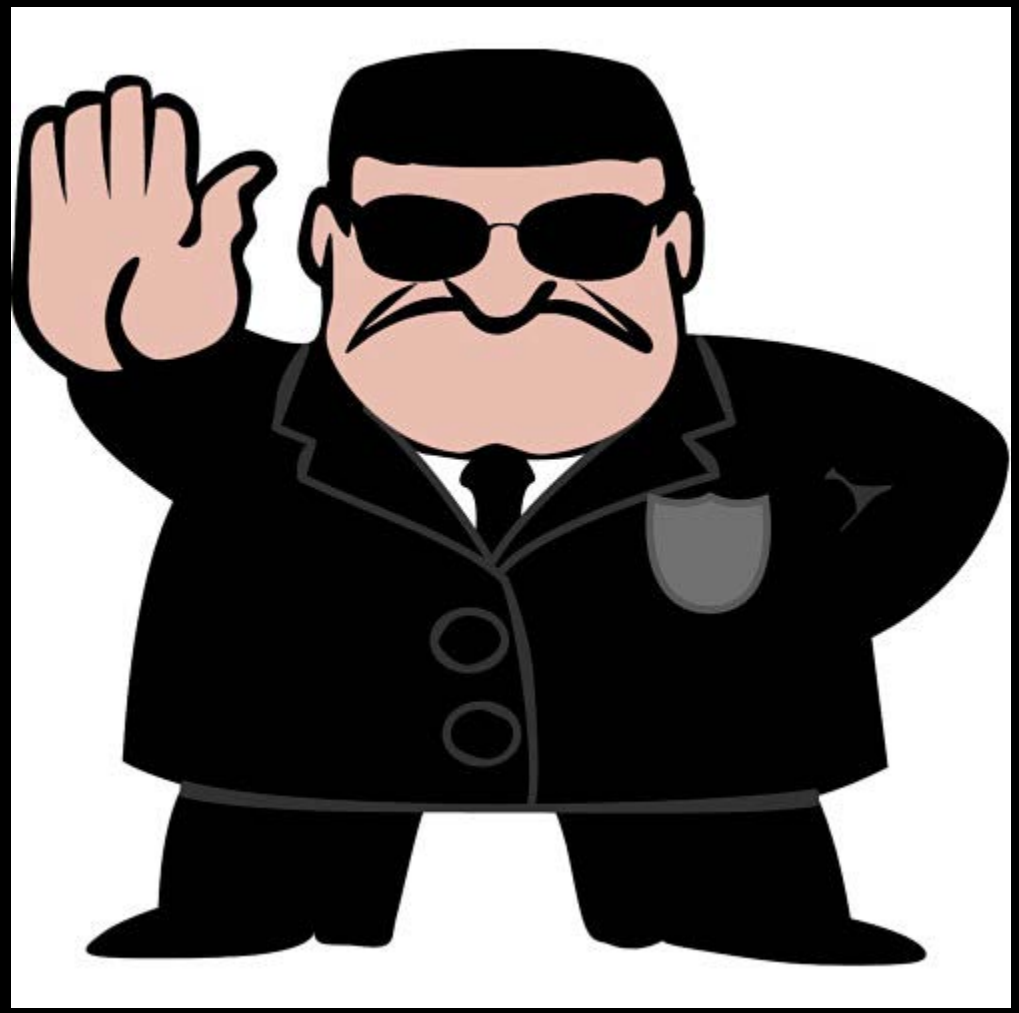


http://www.pewtrusts.org/~/media/assets/2017/08/first-report-of-the-code-project-developing-international-seabed-authority-environmental-regulations.pdf

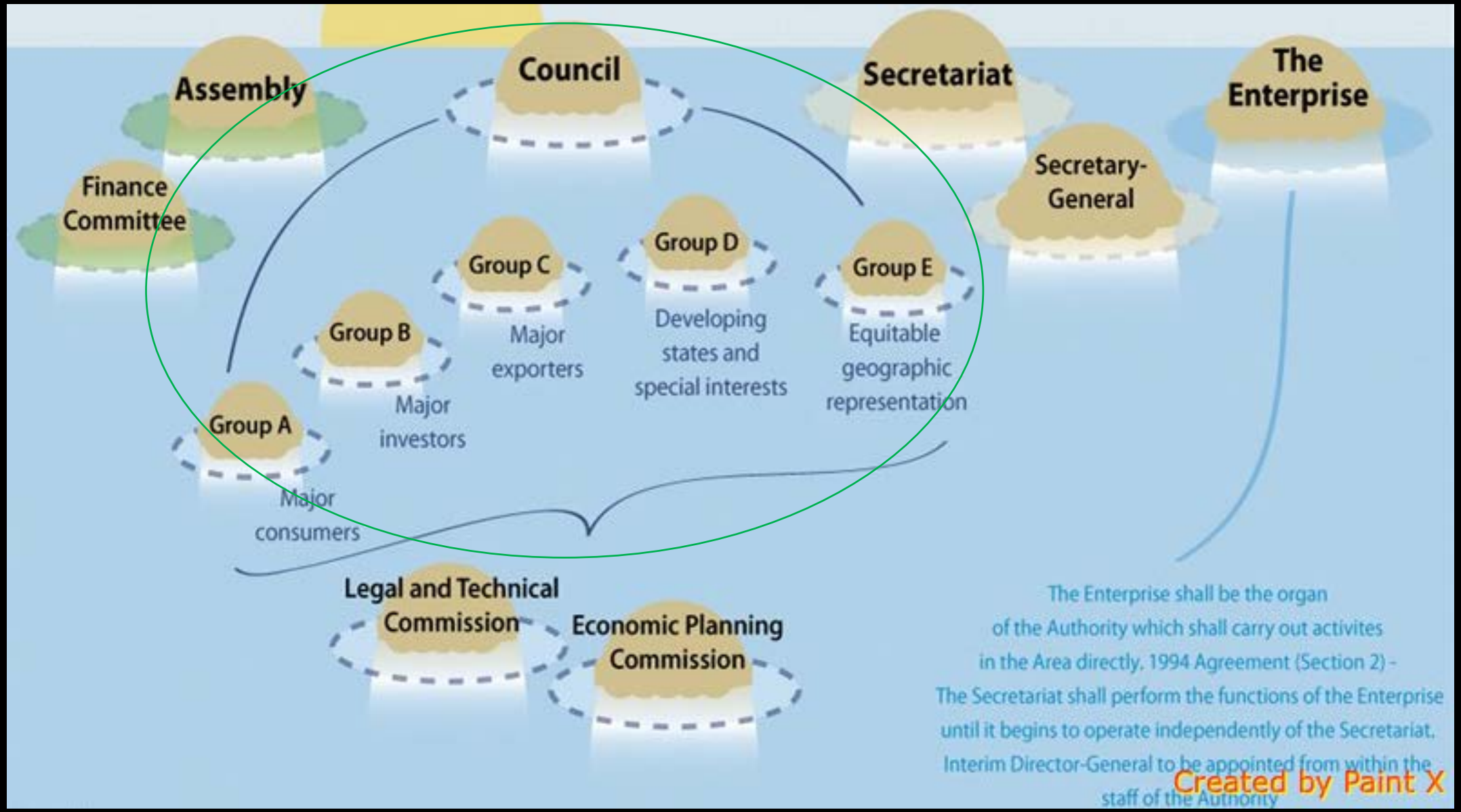
Gjerde and Jaeckel, 2017
Code Project Issue Paper #1 Effective Protection
Graphic courtesy Aline Jaeckel

Article 139: States have responsibility to ensure compliance and are liable for damage caused by failure to carry out that responsibility

Article 153: ISA shall exercise control necessary to secure compliance



The International Seabed Authority



Source: grida.no

Fast forward 50 years: biodiversity to rival rainforests

A new order of anemone discovered by Diva Amon and Craig Smith, University of Hawai‘i at Mānoa.

New exploration tools reveal a wealth of environmental heterogeneity

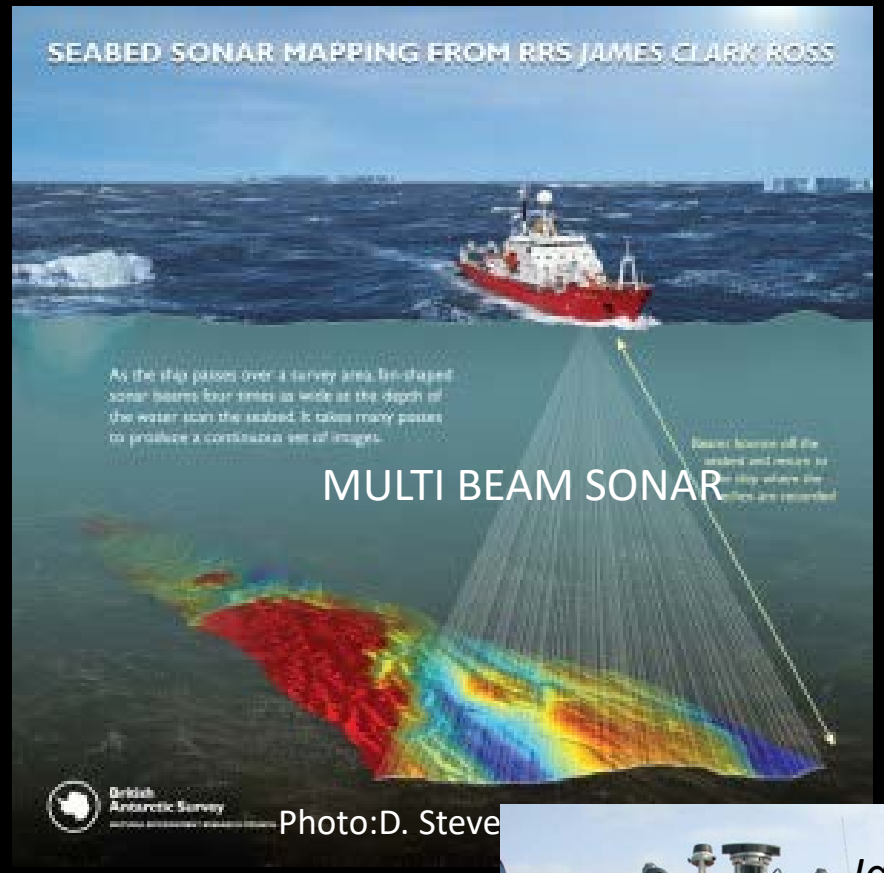
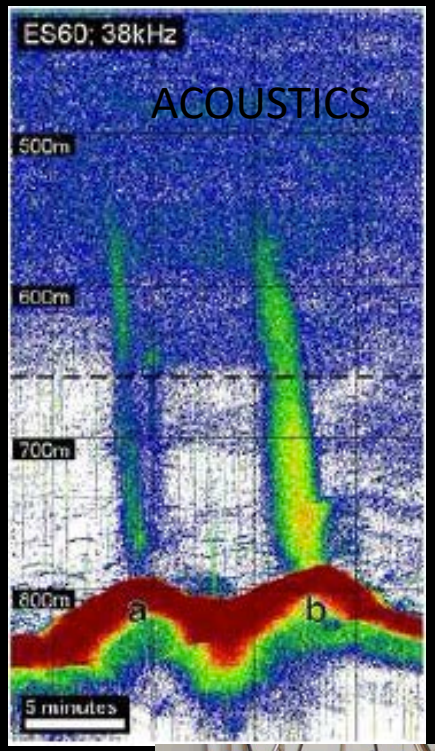
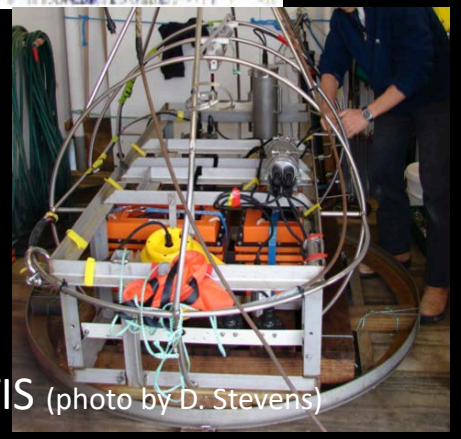


Photo:D. Steve



Jason (ROV)



DTIS (photo by D. Stevens)

AUV

(AUV)

Slide courtesy Lisa A. Levin, PhD.

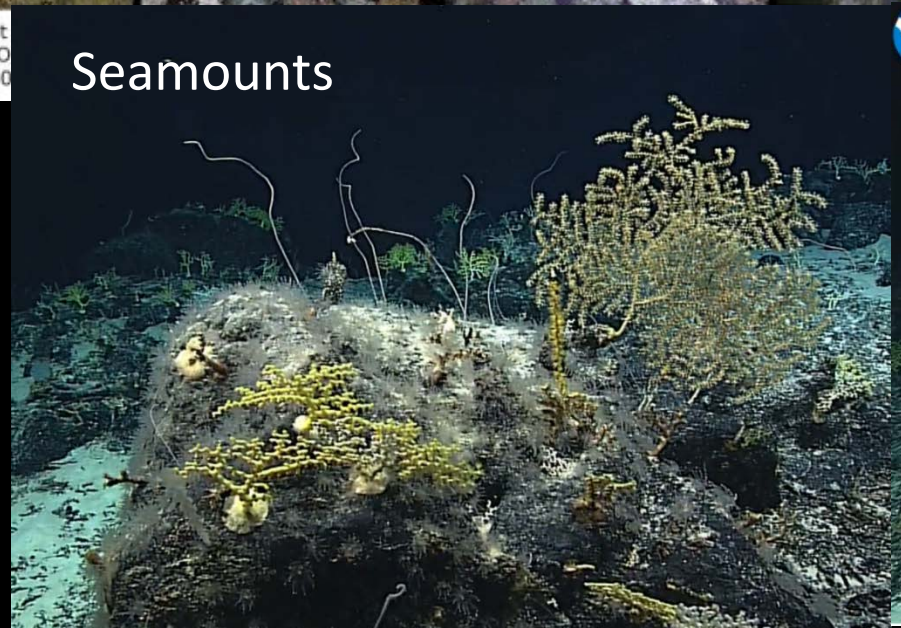
Substrate heterogeneity promotes biodiversity

Vents

Dragon Vent
SW Indian O
Depth ~280

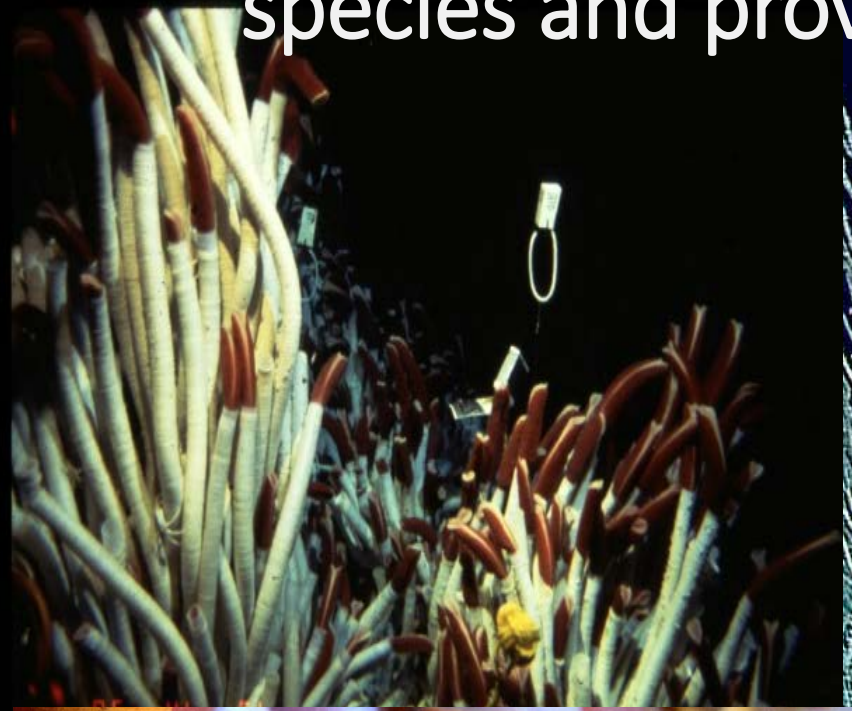
Polymetalic Nodules

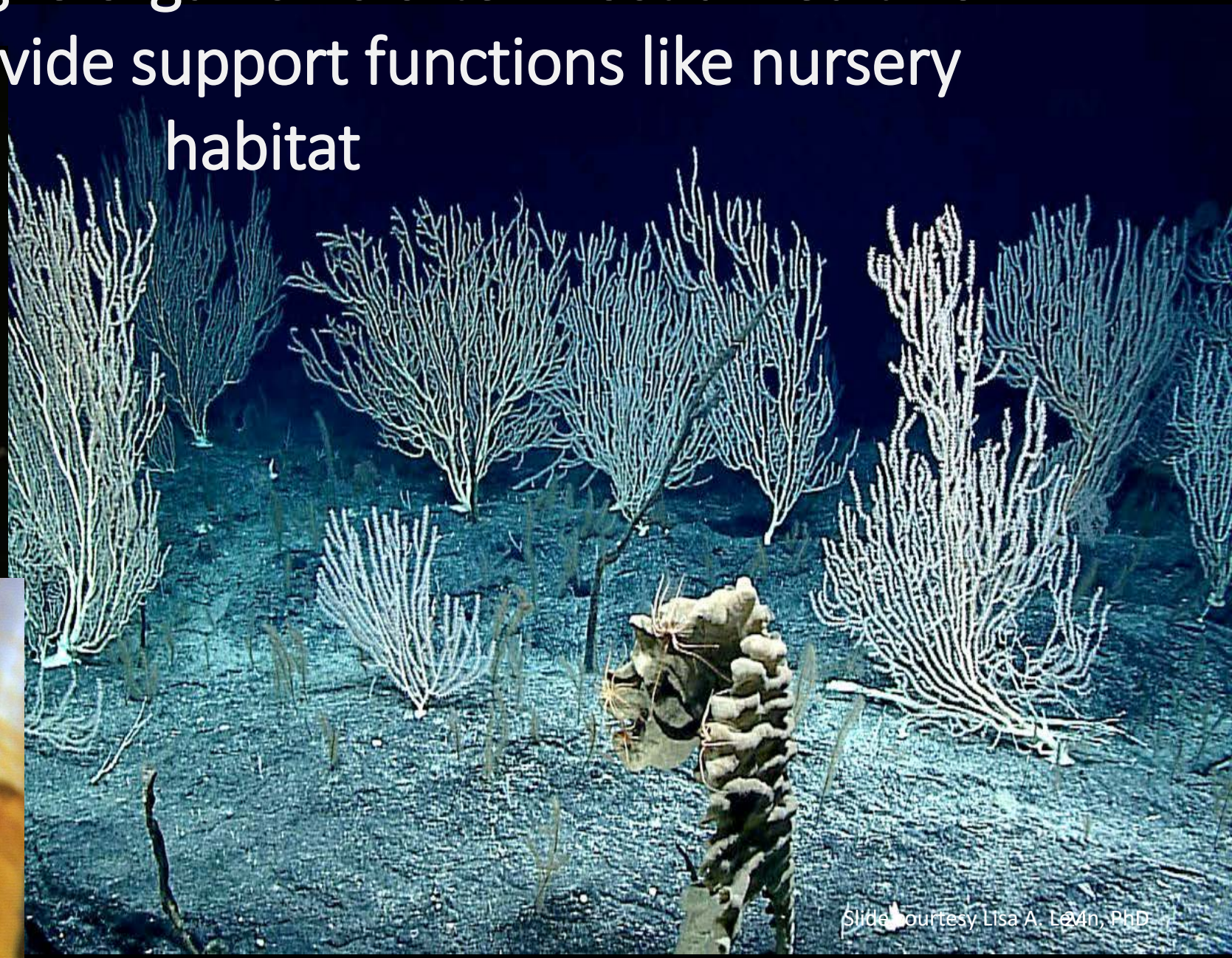
Seamounts



Slide courtesy Lisa A. Levin, PhD.

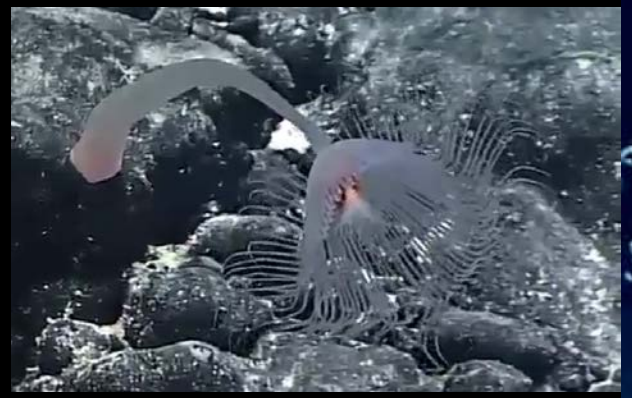
Complex and fragile organisms often host a wealth of species and provide support functions like nursery habitat

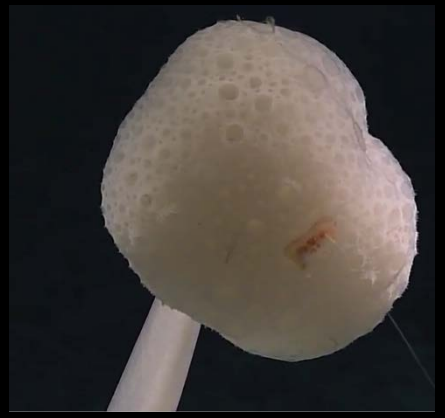


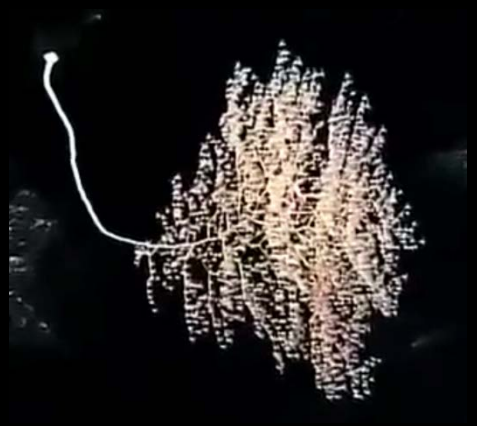


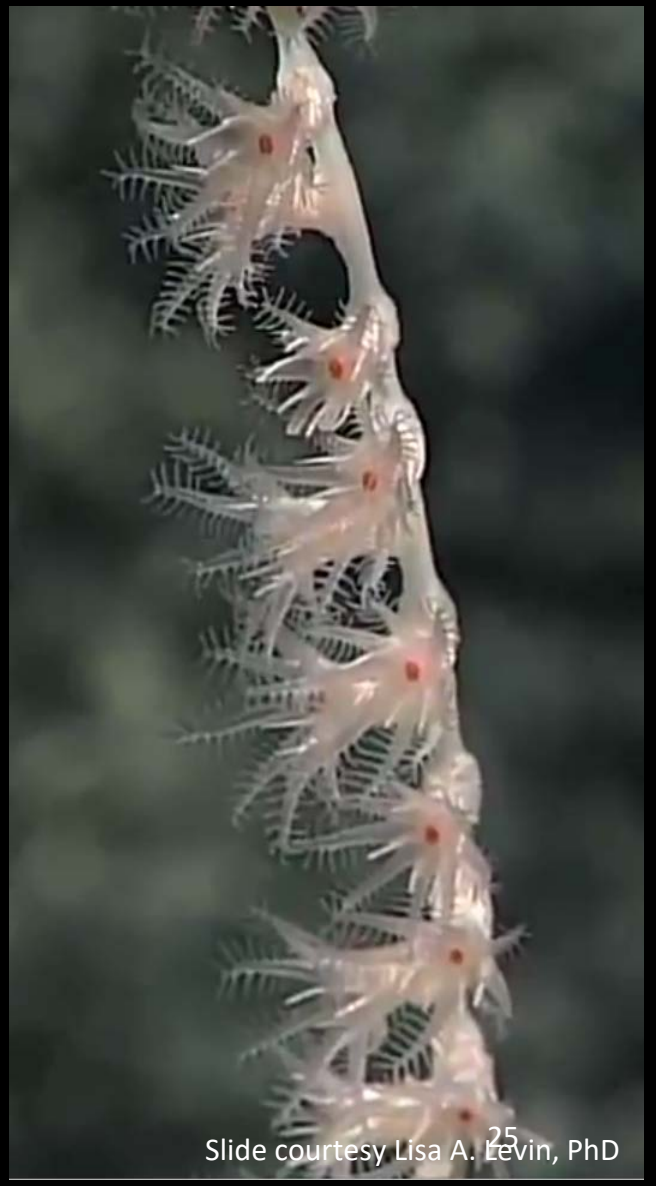
Slide courtesy Lisa A. Levin, PhD

Filter feeders depend on clear clean water









Slide courtesy Lisa A. Levin, PhD

Valuable Functions & Services

Provisioning Services: fish, shellfish, (oil, gas) pharmaceuticals, industrial agents, biomaterials

Support Functions: habitat, trophic support, refugia, nursery grounds

Regulating Services: Climate mitigation:

carbon sequestration, nutrient cycling

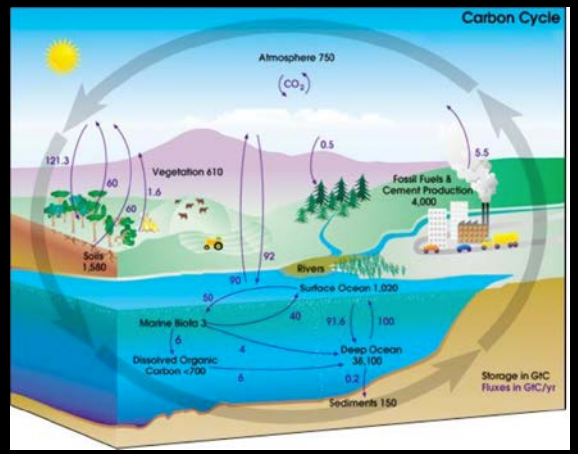
Biodiversity: genetic resources, biomaterials, adaptation to change

Scientific Research

Communications

Artistic Inspiration

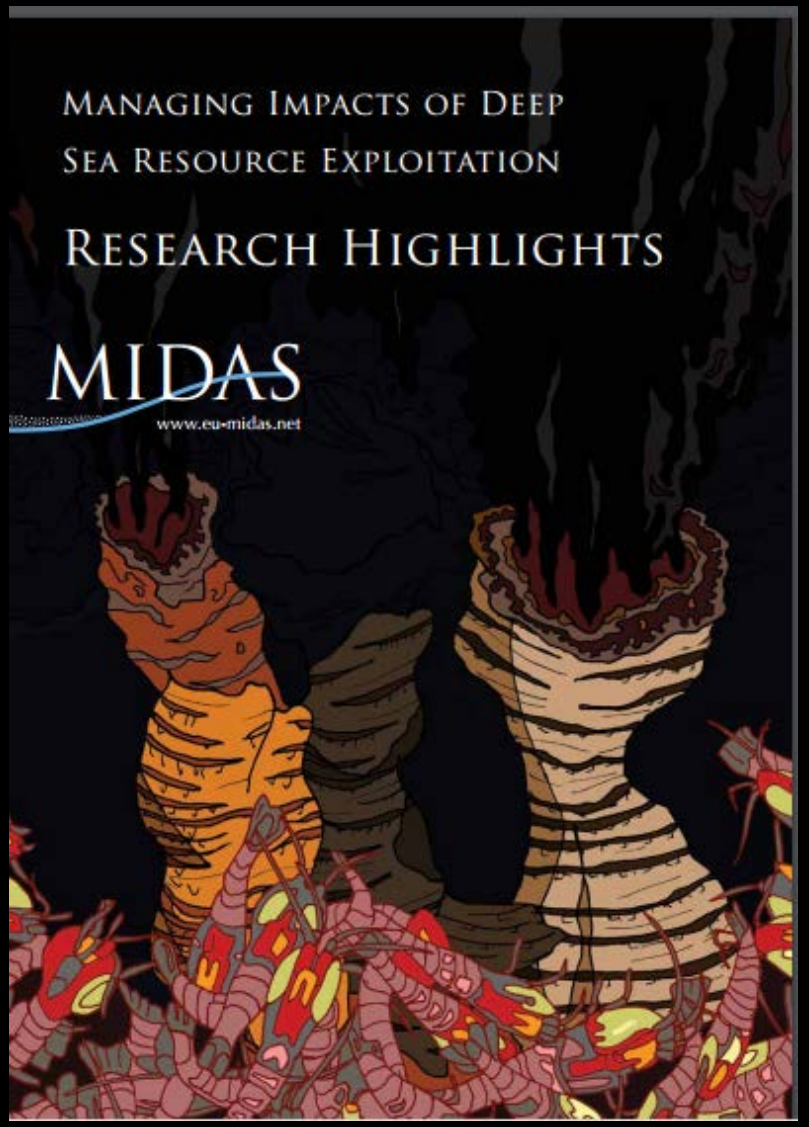
Education

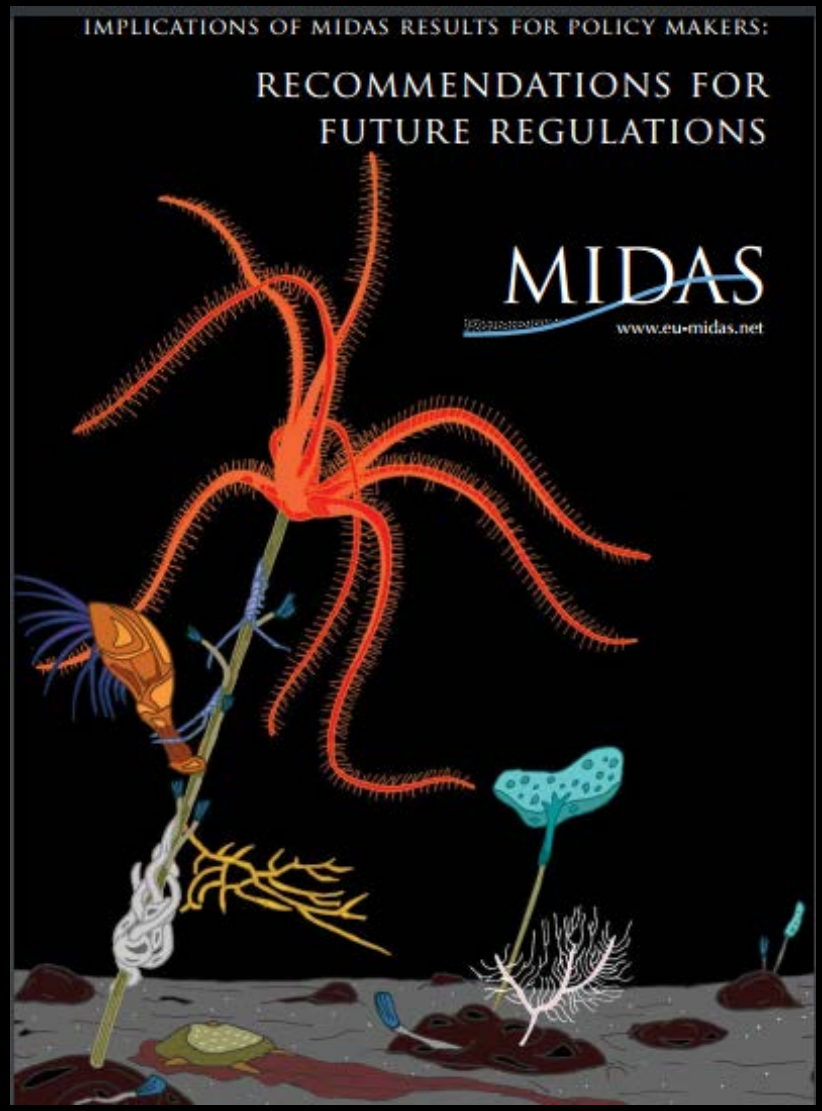


Lisa A. Levin

Nodule growth may be as slow as 1-10 mm per million years

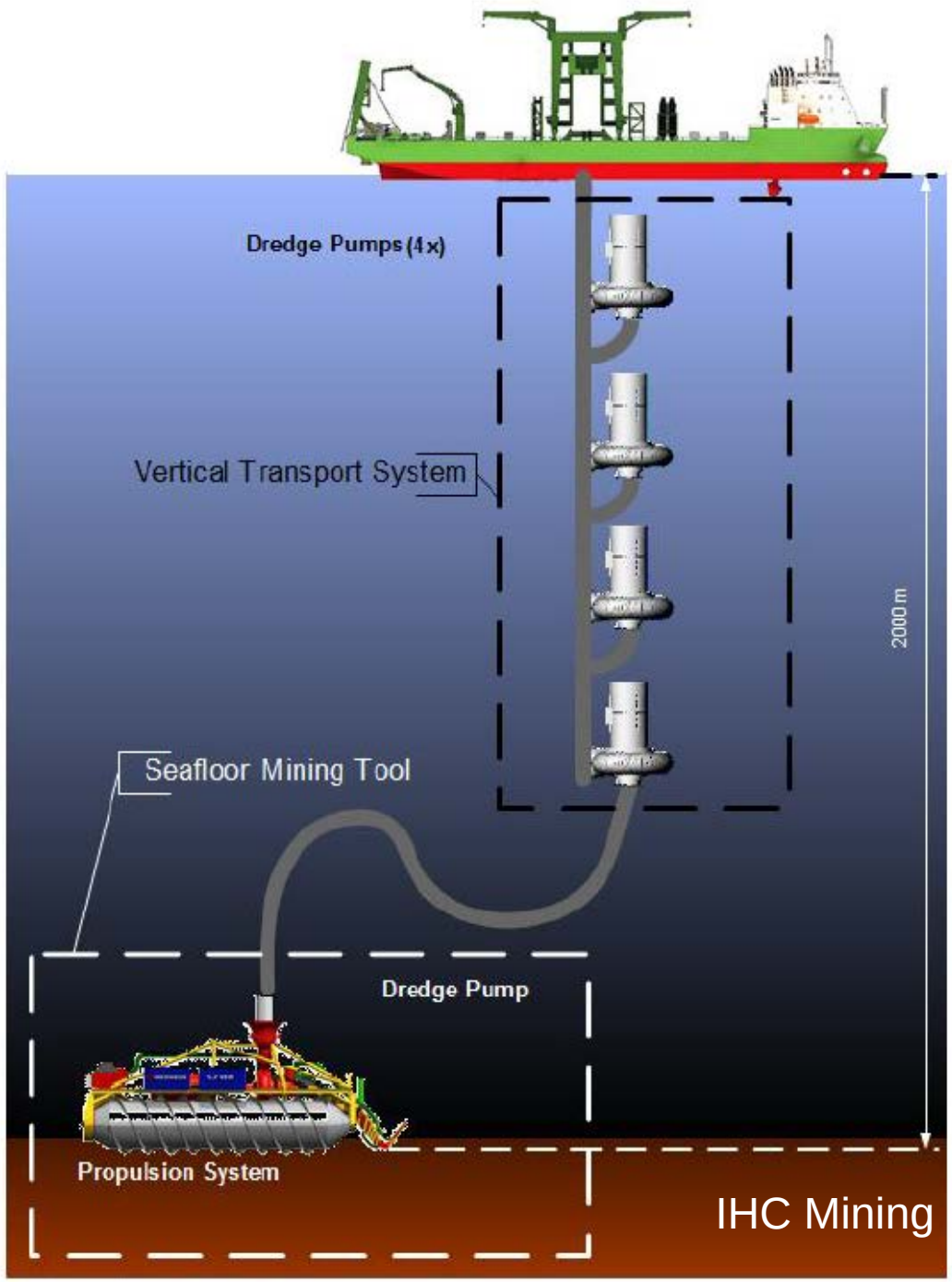
Impacts of Mining: Recent Research Results





http://www.eu-midas.net/

Impacts of Deep-sea Manganese Nodule Mining



Light, pollution from ship

Trans-shipment plume

Returned water plume

Noise, vibration

Large area impacted (connectivity, ecosystem function, recovery etc)

Generation of benthic plume

Substrate removal (nodules)

Removal of surficial sediment layer

Sediment compaction

Extremely slow recovery of ecosystems

This area in the French claim in the Clarion Clipperton Zone was dredged 26 years before this photograph was taken.

-> Stalks and the nodules they attach to are a required niche for species
(protection, exposure to oxygenated water?)
-> Almost no stalks in ploughed areas

Sponges colonising dead sponge stalk, along with amphipods, isopods, barnacle.

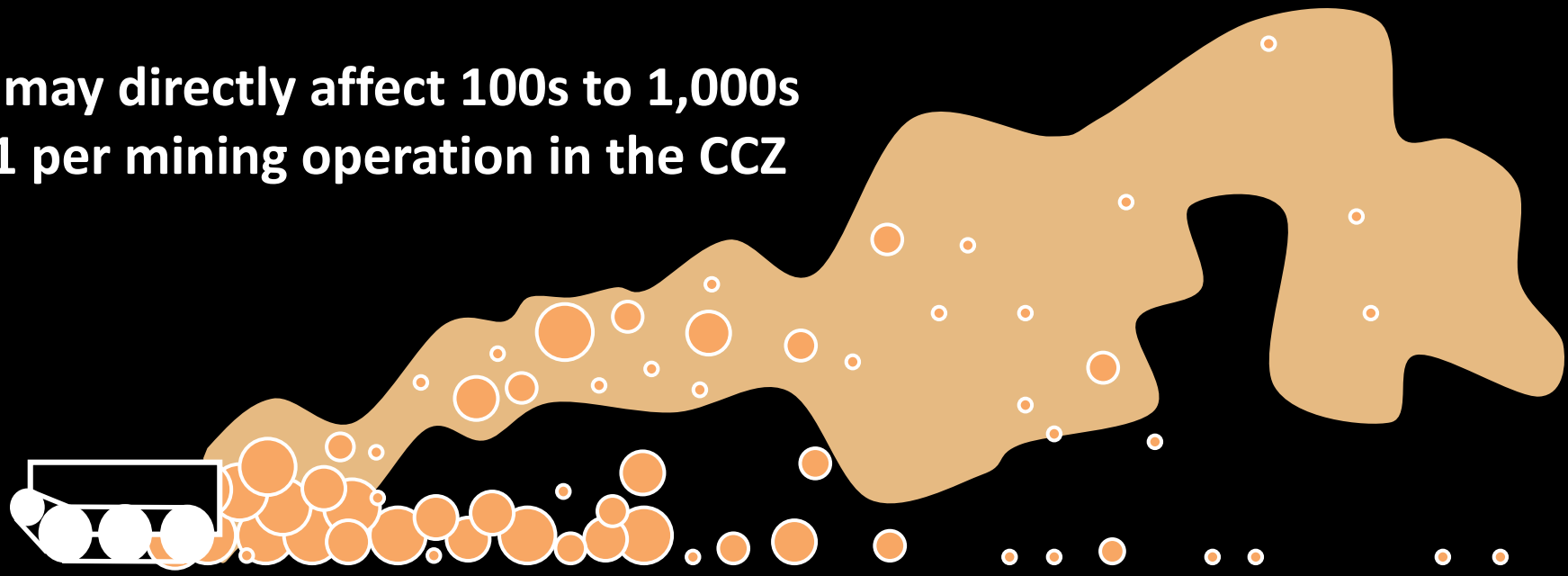
***Graneledone* sp. deep sea octopi brooding eggs on dead sponge stalks.**

Purser et al. 2016

WP2 Plumes

- Clouds of sediment laden water may be generated by the collector vehicle
- Dewatering of ores on the ship will also generate a plume that will be added to the ocean

→Impacts may directly affect 100s to 1,000s of km2 yr-1 per mining operation in the CCZ

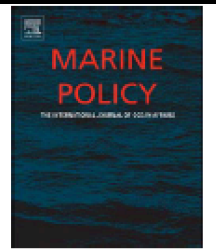


Courtesy Andy Dale SAMS, UK

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol



Defining "serious harm" to the marine environment in the context of deep-seabed mining

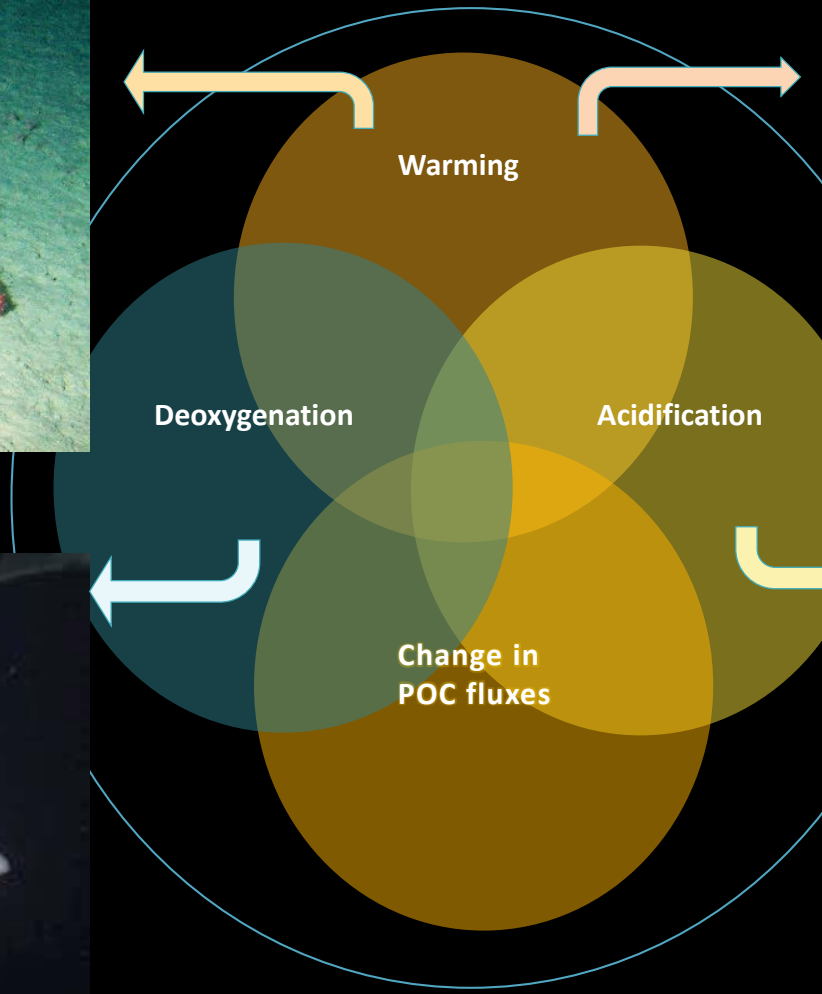
Lisa A. Levin[a,*], Kathryn Mengerink[b], Kristina M. Gjerde[c], Ashley A. Rowden[d], Cindy Lee Van Dover[e], Malcolm R. Clark[d], Eva Ramirez-Llodra[f], Bronwen Currie[g], Craig R. Smith[h], Kirk N. Sato[i], Natalya Gallo[i], Andrew K. Sweetman[j], Hannah Lily[k], Claire W. Armstrong[l], Joseph Brider[m]

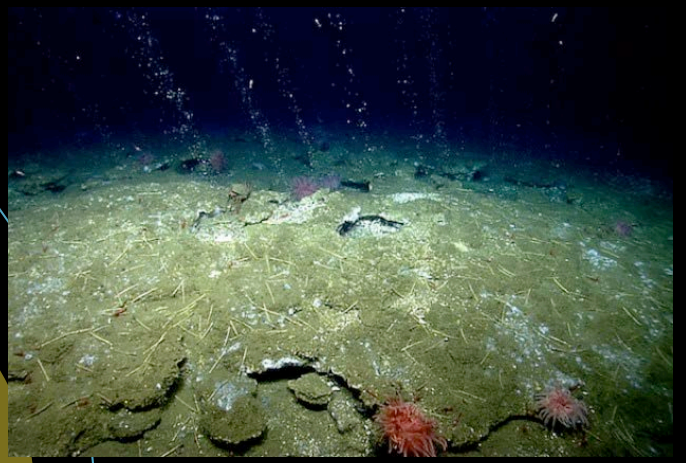
- Extent
- Duration/frequency
- Intensity or magnitude

+

- Probability
- Sensitivity/vulnerability
- Cumulative effects

Climate Change Yields a Multi-Stressor Ocean





Levin & Le Bris 2015

Bopp et al. 2013

Slide courtesy Lisa A. Levin, PhD

Many known unknowns …

Plumes

- Extent and duration of plumes
- Survivability thresholds
- Effects of plumes in water column all depths
- Potential toxicity of plumes
- Possible mitigation measures

Ecotoxicology

- Effects of toxicity from seafloor mining
- Toxic effects of returned water and transshipment plumes
- Eco toxicity measures and indicators

Species connectivity

- How special make connections across range
- Connectivity of vent and non-vent fauna

Ecosystem function

- How to measure ecosystem function
- How to measure? Technologies, sensors & methods

Ecosystem recovery

- Key species and community
- Effects of sediment compaction
- Mining deposit of semi-fluid layer

Wider issues

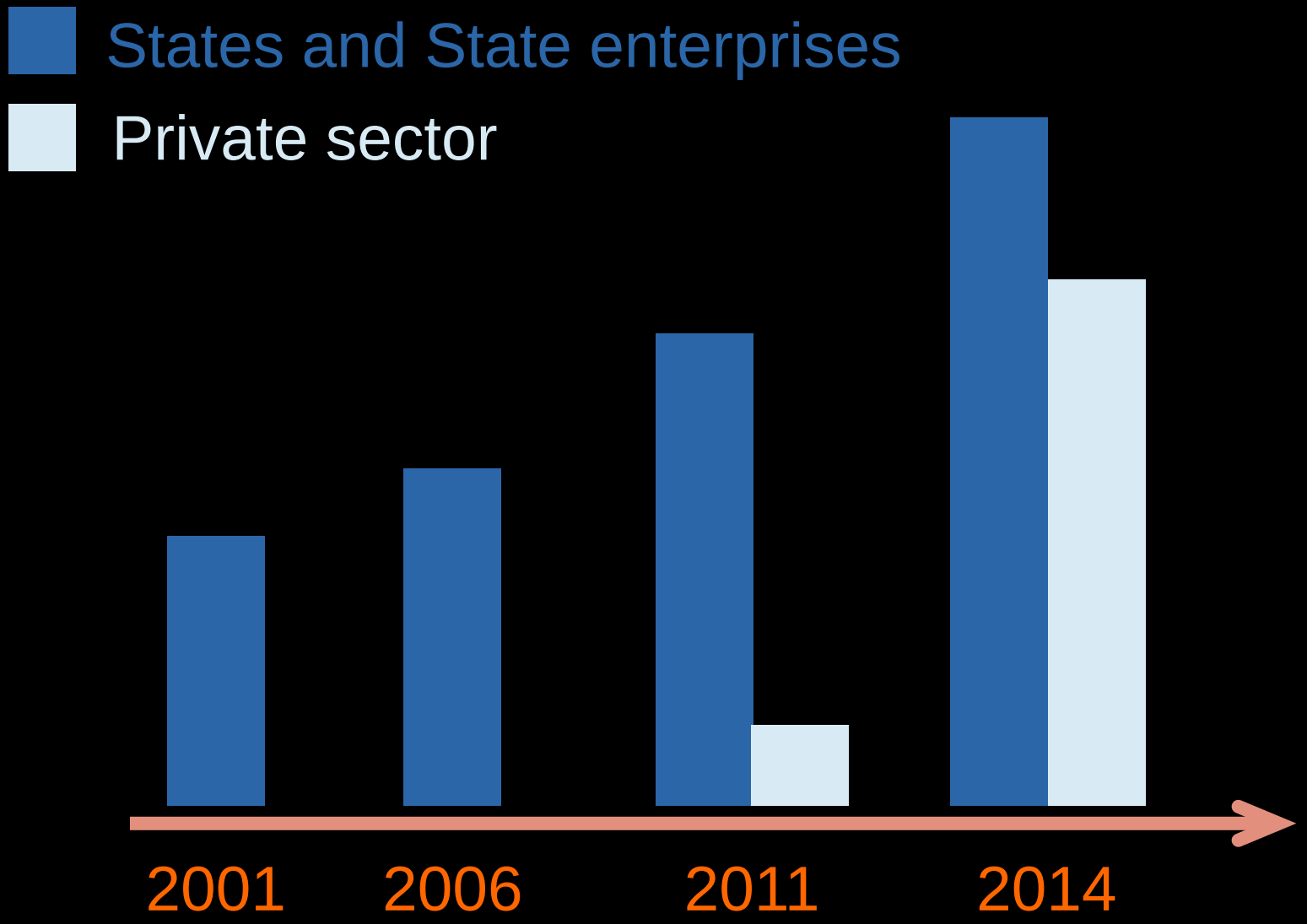
- Noise, light, vibration
- Adjacent areas
- Effectiveness of mitigation strategies.

Weaver, Billett, Gebruk, Jones, Morato, 2017. Code Project Issue Paper #12 Recommendations for Further Research

Many unknowns remain but interest increasing

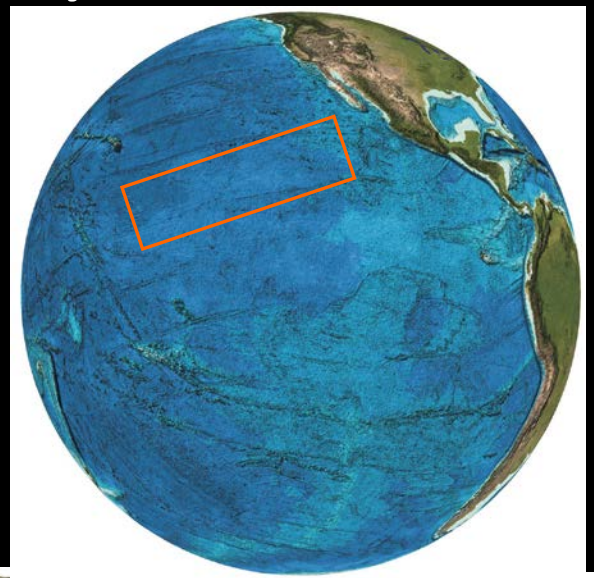
Photo courtesy of Daniel Jones, National Oceanography Centre

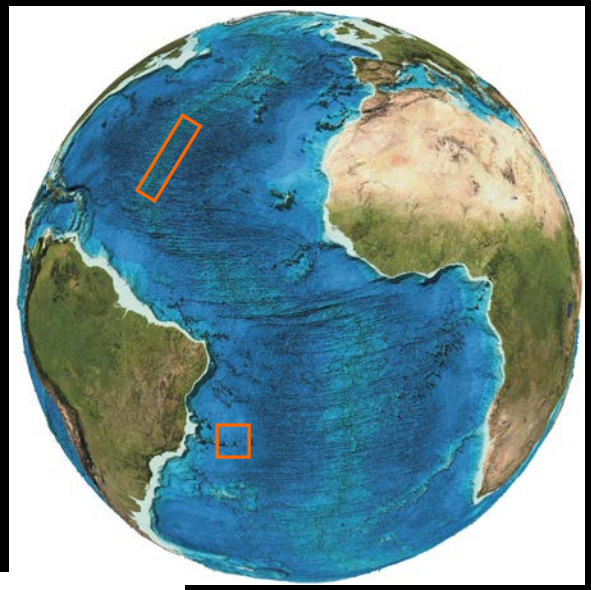
Current status of Deep Seabed Mining

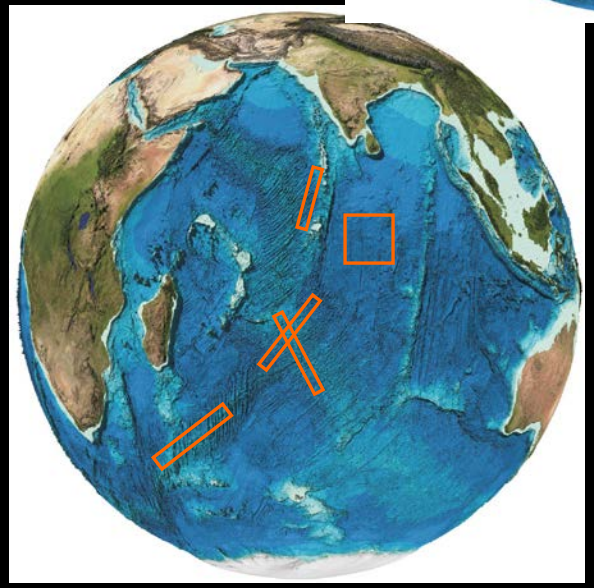


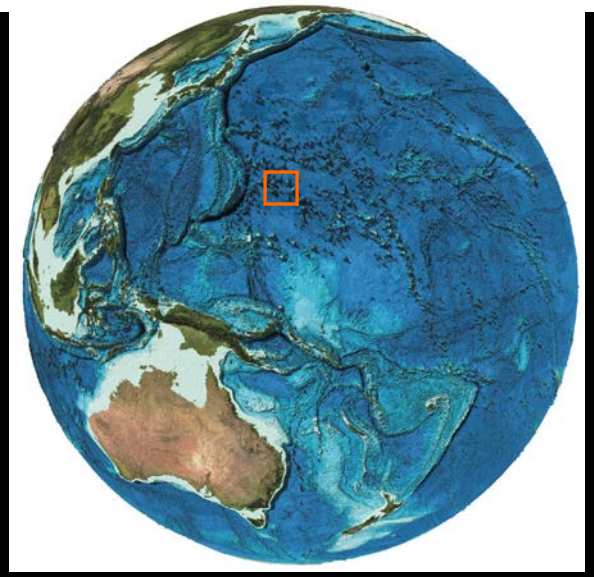
Slide courtesy Michael Lodge, ISA

1,200,000 km^2 = area of 27 seabed exploration contracts beyond national boundaries









19 of the total of 27 exploration contracts approved by the ISA since January 2011

Maps courtesy Michael Lodge, ISA

Existing Regulatory Framework

Annex III to UNCLOS (Conditions of exploration and exploitation)

Polymetallic nodules (2000)

Polymetallic sulphides (2010)

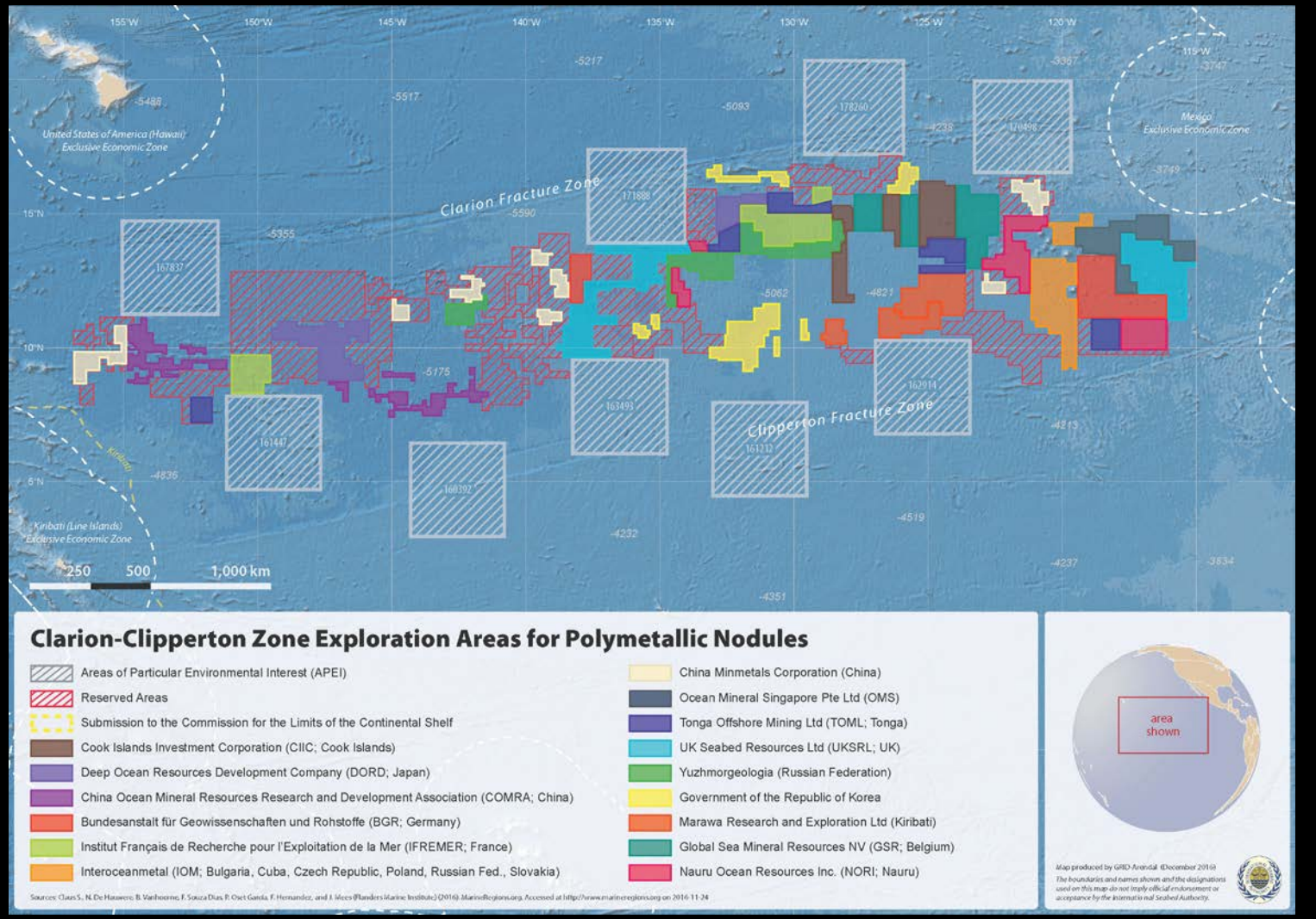
Cobalt-rich crusts (2012)

ISA Regulations on Prospecting and Exploration

Exploitation Regulations under development

Environmental management plan for the Clarion Clipperton Zone

Contractor blocks and Areas of Particular Environmental Interest (APEIs)



CCZ = 5,300 million km^2

UNCLOS Art. 154 Periodic review

- “Every five years ….the Assembly share undertake a general and systematic review” of the operation of the regime


WWF INTERNATIONAL
PERMANENT COMMISSION OF THE SOUTH PACIFIC

Missed opportunity

- Improved oversight of contractors
- Open meetings of Legal and Technical Commission
- Environmental committee or commission

ISBA/23/LTC/CRP.3*
8 August 2017
English only

Draft *Regulations on Exploitation of Mineral Resources in the Area*

Emerging Regulatory Regime
Draft Regs
Comments Due 17/11/17

4. The Commission shall determine if the proposed Plan of Work:

(a) Optimizes the recovery and extraction of the Minerals;

(b) Reflects the economic life of the Exploitation project;

(c) Following the Commission's examination under regulation 21, provides for the effective protection of the Marine Environment in accordance with Article 145 of the Convention including the application of Best Environmental Practices and a precautionary approach;

(d) Provides for the effective protection of human health and safety;

(e) Provides for Exploitation Activities to be carried out with reasonable regard for other activities in the Marine Environment, including, but not limited to, navigation, laying of submarine cables and pipelines, fishing and scientific research; and

Legal and Technical Commission recommendations are more than that!

(a) The Council shall approve a recommendation by the Legal and Technical Commission for approval of a plan of work **unless by a two-thirds majority of its members present and voting**, ...the Council decides to disapprove a plan of work.

1994 AGREEMENT, ANNEX, SECTION 3,

PARAGRAPHS 11 AND 12

Draft regulations: Contractor obligations

Section 6 Diligent operations

Ensure the effective protection of the Marine Environment from harmful activities and **monitor** the impact of the Exploitation Activities and ensure that they **do not cause serious harm** to the Marine Environment;

DR Annex VII Standard Clauses for Exploitation Contract

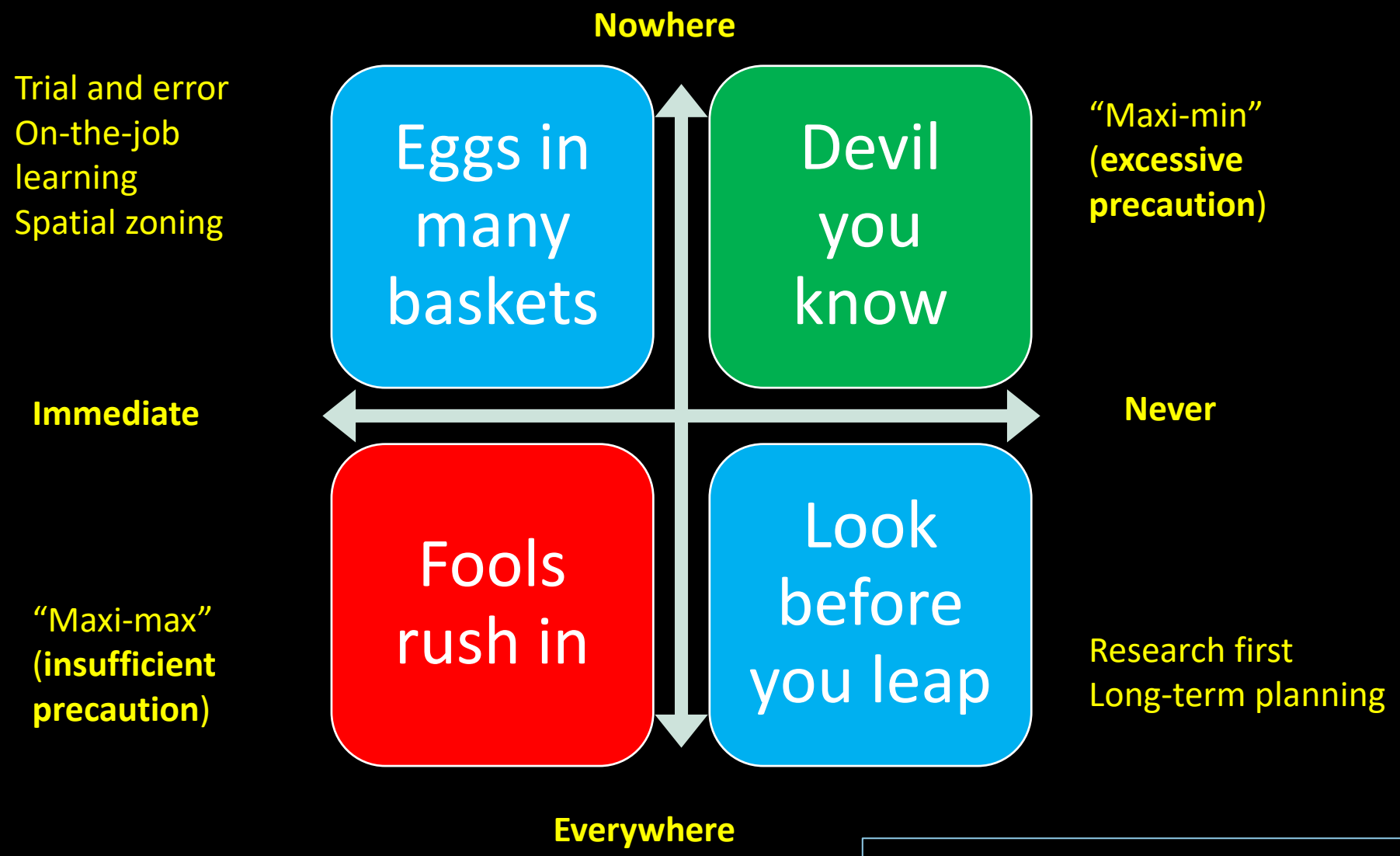
Draft Regulations: defining “serious harm”

Schedule 1 - Use of terms and scope

- "**Serious Harm** to the Marine Environment" means any Environmental Effect from activities in the Area ….beyond that which is negligible or **which has been assessed and judged to be acceptable by the Authority** pursuant to these Regulations and the relevant rules and regulations adopted by the Authority.

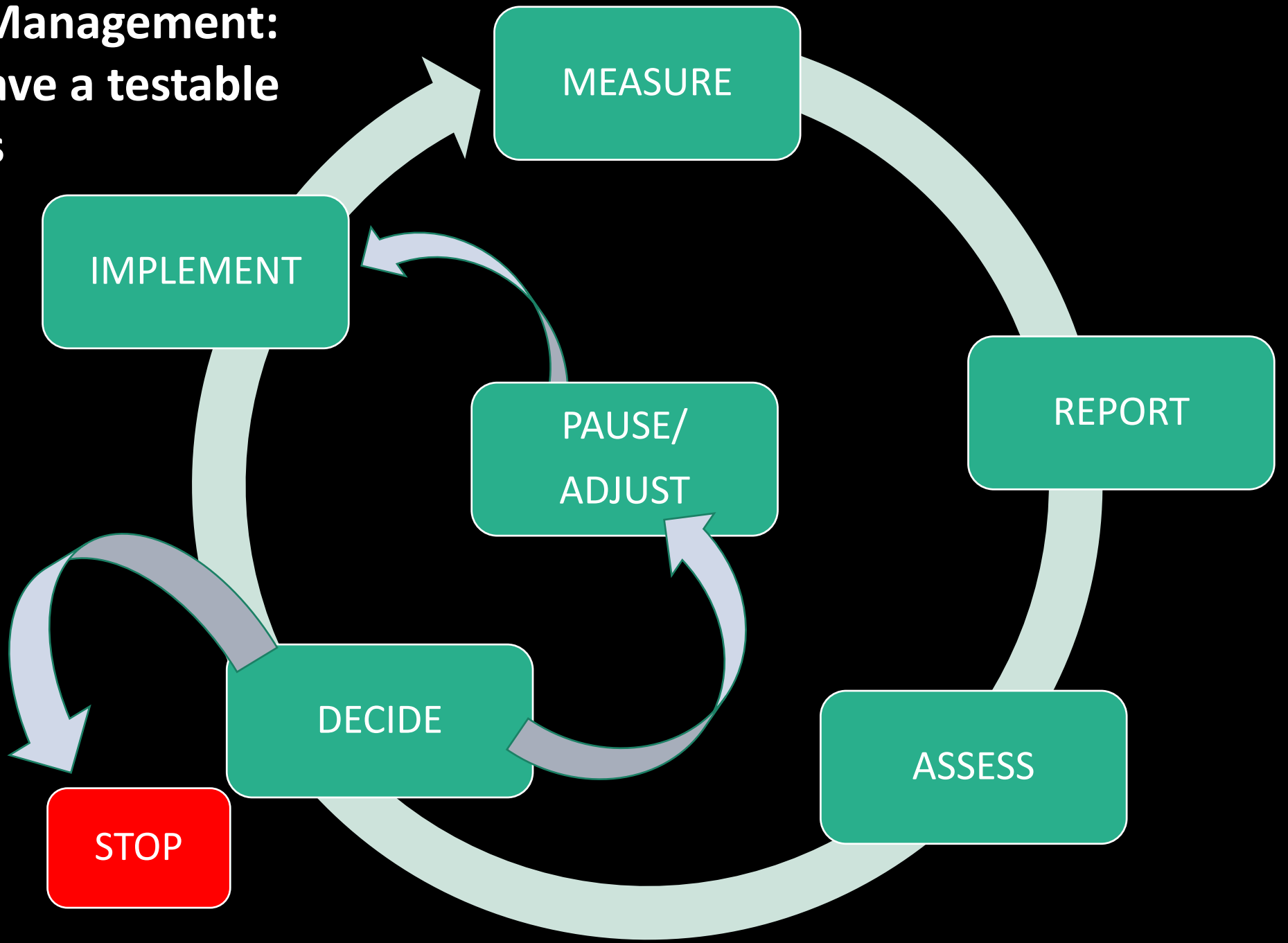
What is “acceptable harm” in an uncertain world?

Precautionary Strategies for DSM



Tinch & Van der Hove, 2016 D9.5

Adaptive Management: Need to have a testable hypothesis



Adaptive Management: environmental challenges posed by DSM
Malcolm Clark, Richard Johnson
Griffith Law School/ISA Environmental Workshop

Testing for “Harmful effects”?

Baselines
Thresholds
Environmental targets
Monitoring capability
Response capacity

Pardo’s dream or Pardo’s nightmare?

Do we know enough to proceed?

Slide credit: Lisa Levin; Artwork Tanya Young

Many known unknowns …

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- Effectiveness of mitigation strategies.

Weaver, Billett, Gebruk, Jones, Morato, 2017. Code Project Issue Paper #12 Recommendations for Further Research

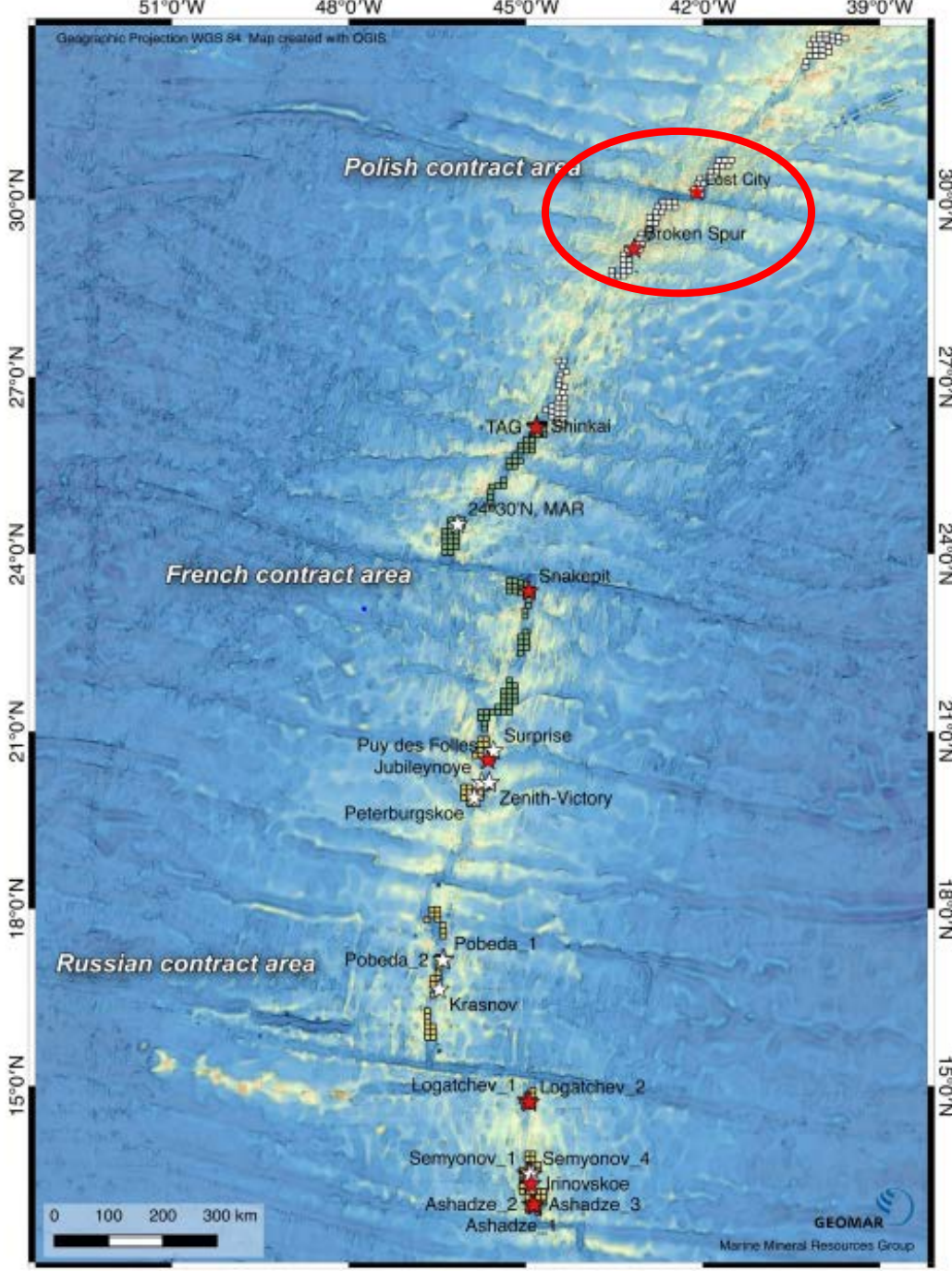
Can we test for and respond to “Harmful effects”?

Baselines
Thresholds
Environmental targets
Monitoring capability
Response capacity

Can we protect our common natural heritage?

Lost City Hydrothermal Field, Atlantis Massif, Mid-Atlantic Ridge

Courtesy of IFE, URI-IAO, Lost City science party, and NOAA



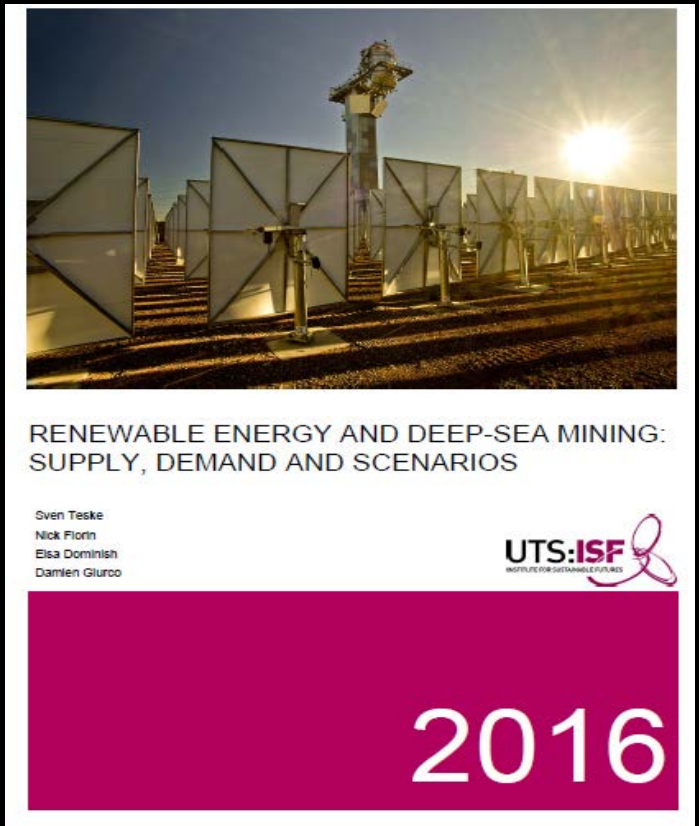
Map courtesy Sven Petersen

Is mining consistent with SDG 14.2?

Deep Atlantic Stepping Stones Research Group/IFE/URI/NOA

SDG 14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Is there an overriding social need for the minerals?



- Transition to 100% renewable energy economy by 2050 can be done without sourcing supplies from deep-sea

- Copper
- Nickel
- Silver
- Specialty metals (Tellurium)
- Rare Earths (Neodymium, Dysprosium)

Cobalt

Lithium

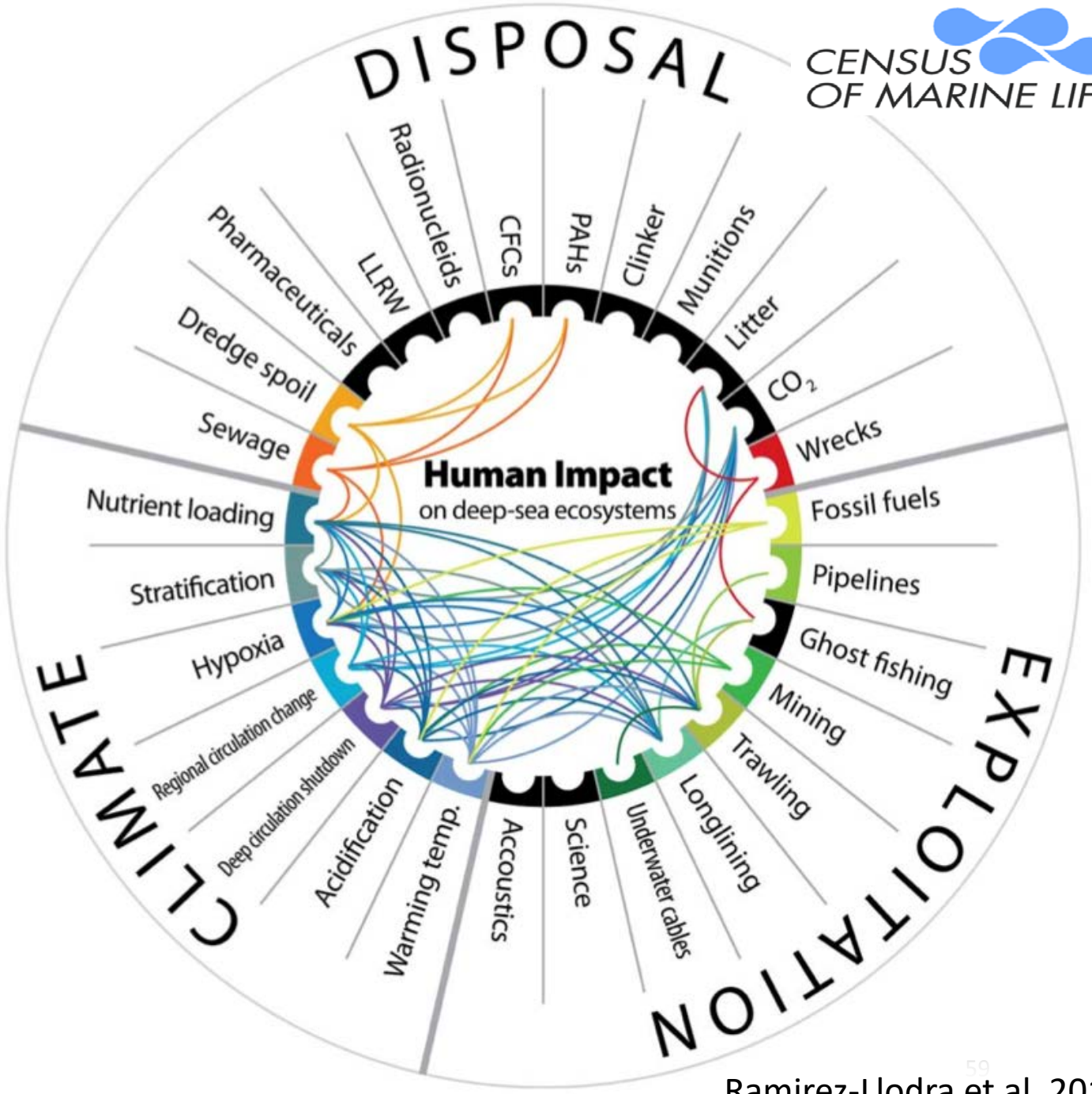
Teske, S., Florin, N., Dominish, E. & Giurco, D. 2016,
Renewable Energy and Deep Sea Mining: Supply, Demand and Scenarios.
University of Technology Sydney
https://opus.lib.uts.edu.au/handle/10453/67336

Can nature withstand further impacts?

"The greatest threat to the ocean comes from a failure to deal quickly with the manifold problems that have been described above."

UN Regular Process, 2015. FIRST GLOBAL INTEGRATED MARINE ASSESSMENT

http://www.un.org/depts/los/global_reporting/WOA_RegProcess.htm



CENSUS OF MARINE LIFE

Ramirez-Llodra et al. 2011

Forty years from now

children will live in a world

shaped by our choices

Gregory C. Johnson, 2013
Climate Change Science Haiku

The Promises of the Common Heritage

"The common heritage of humankind is a major innovation in international law: its revolutionary vision has far-reaching implications, particularly at this juncture when ocean sustainable development is at the top of many national agendas."

(Earth News Bulletin ISA-23 FINAL)

Online at: http://enb.iis d.org/isa/2017/

Photo credit: V. Tunnicliffe

The Promises of the Common Heritage

…With these earnest words, the African Group summed up both the unique history and mandate of the International Seabed Authority—

the only functioning international organization that directly regulates and manages natural resources that no state can appropriate for itself—and its challenges in **delivering the promises of the common heritage**:

- sharing financial benefits and advancing marine science for present and future generations,
- while ensuring the protection of the greatest, least-known and most fragile ecosystems on earth."

(Earth News Bulletin ISA-23 FINAL **Online at: http://enb.iis d.org/isa/2017/**

Photo credit: V. Tunnicliffe

Thank you for your attention!

NASA, View from the International Space Station October 2010

ISS025E009840

Preconditions

- Environmental committee
- Transparency and inclusiveness
- Focus on research, observation and assessment

Summary of comparison of land based and deep-sea mining footprints per million tons of ore

Deep sea mining activity	Deep-sea area required per million tons mined ore	Area required to produce same products on land
Nodule mining	~66-83 km^2	~0.52 km^2
Cobalt crust mining	~12.8 - 38 km^2	~0.66 km^2
SMS mining	~0.054 km^2	~0.12 km^2

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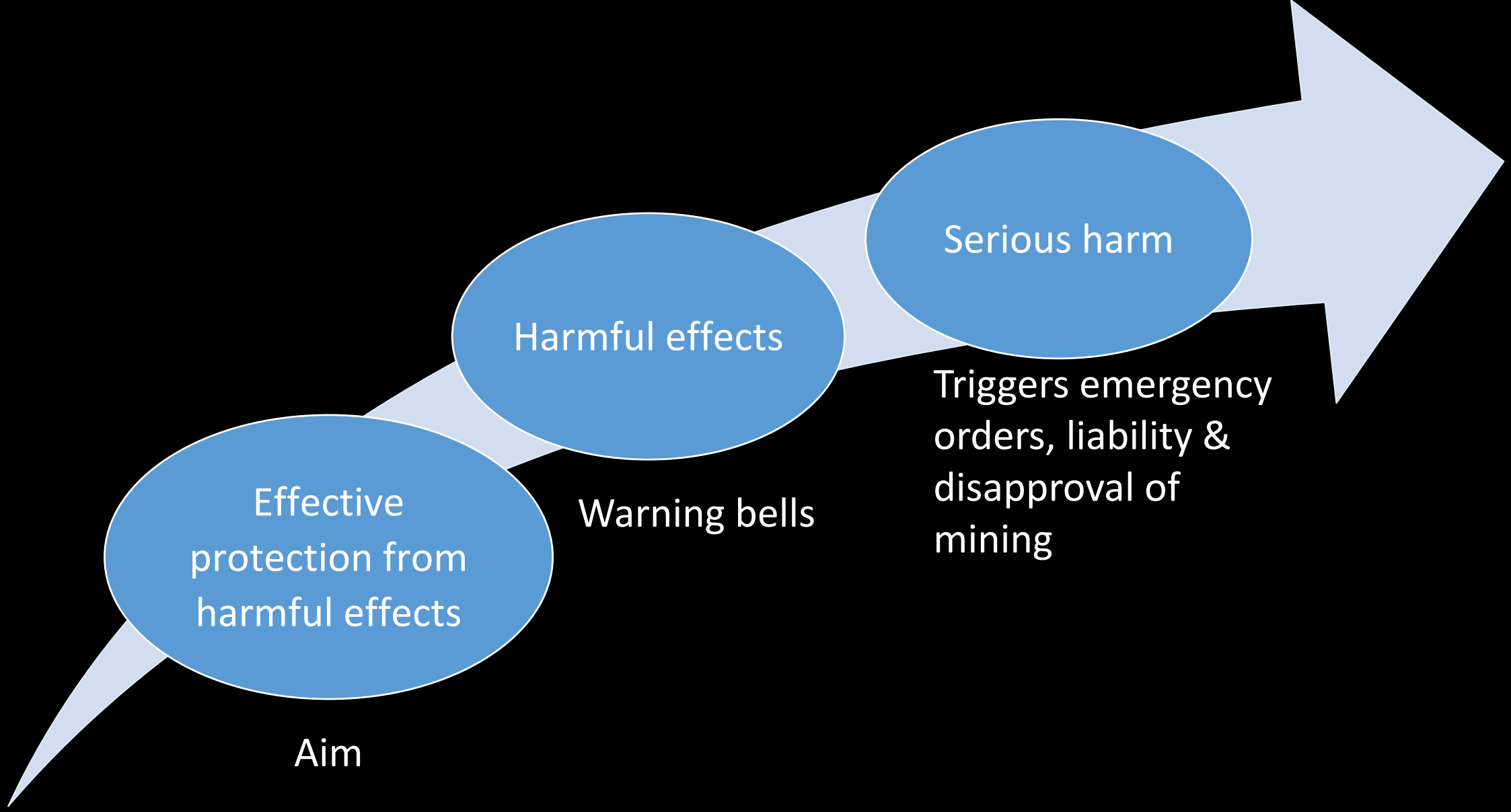


http://www.pewtrusts.org/~/media/assets/2017/08/first-report-of-the-code-project-developing-international-seabed-authority-environmental-regulations.pdf

Gjerde and Jaeckel, 2017
Code Project Issue Paper #1 Effective Protection
Graphic courtesy Aline Jaeckel

Adaptive Management

An **adaptive management approach** includes—

(a) allowing an activity to commence on a **small scale or for a short period** so that its effects on the environment and existing interests can be **monitored:**

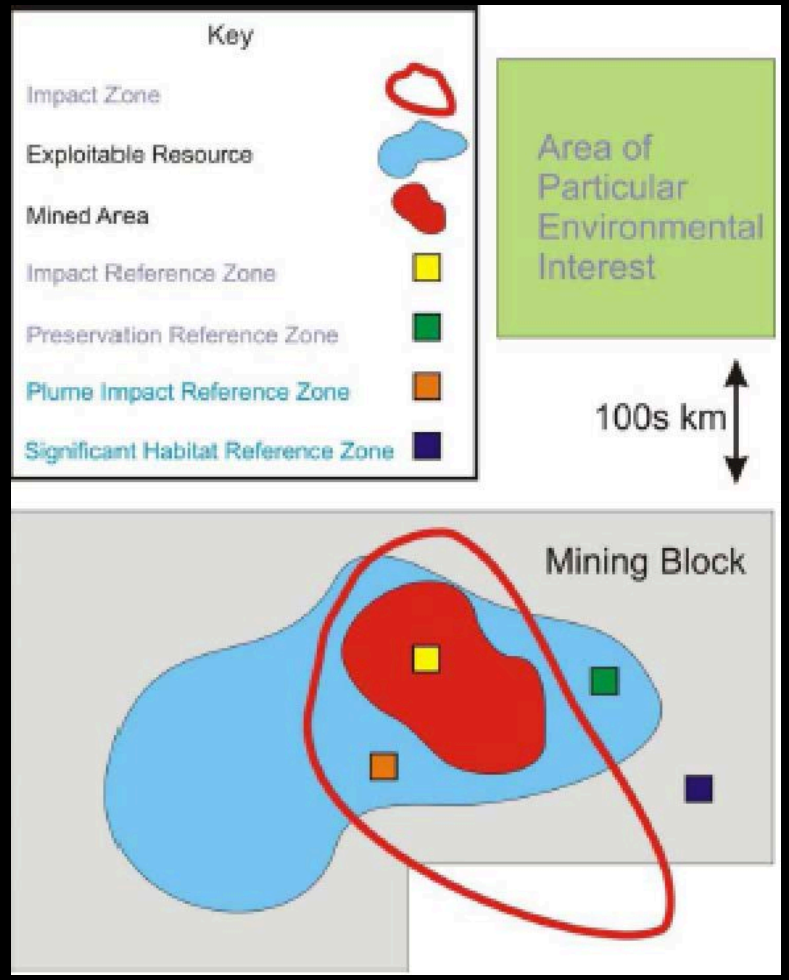
(b) **any other approach** that allows an activity to be undertaken so that its **effects can be assessed** and the activity discontinued, or continued with or without amendment, on the basis of those effects.

s64 (2) NZ EEZ Act 2012

From: Adaptive Management: environmental challenges posed by DSM
Malcolm Clark, Richard Johnson
Griffith Law School/ISA Environmental Workshop

Monitoring within and beyond contract areas

ISA Workshop “Impact Reference Zones, Preservation Reference Zones”
Berlin, Germany 27-29 September 2017



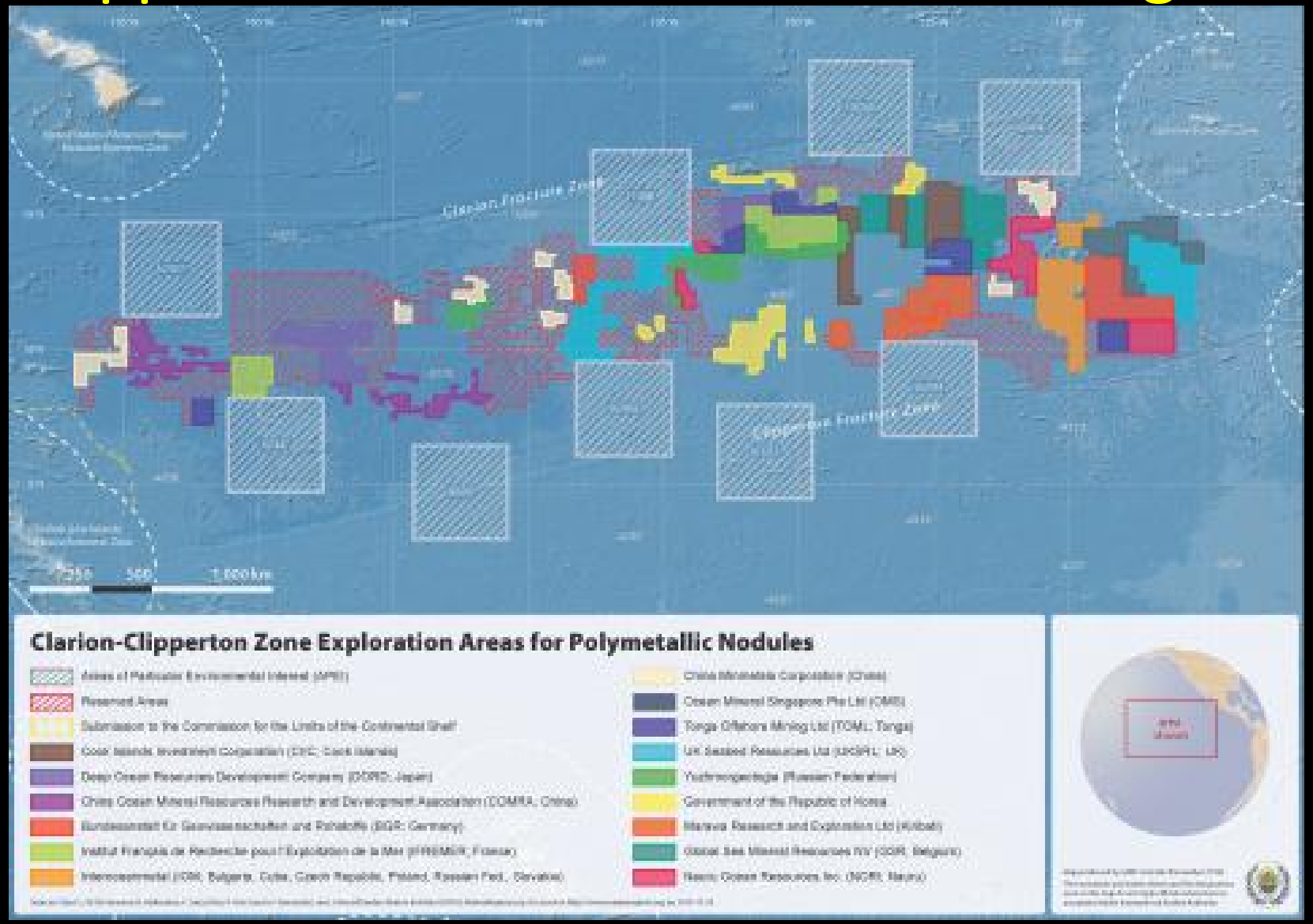
“**Impact reference zones**” are areas to be used for assessing the effect of each contractor’s activities in the Area on the marine environment and which are representative of the environmental characteristics of the Area.

“**Preservation reference zones**” means areas in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the flora and fauna of the marine environment.

Jones and Weaver – White Paper

Regional-scale planning:

Clarion Clipperton Zone Environmental Management Plan

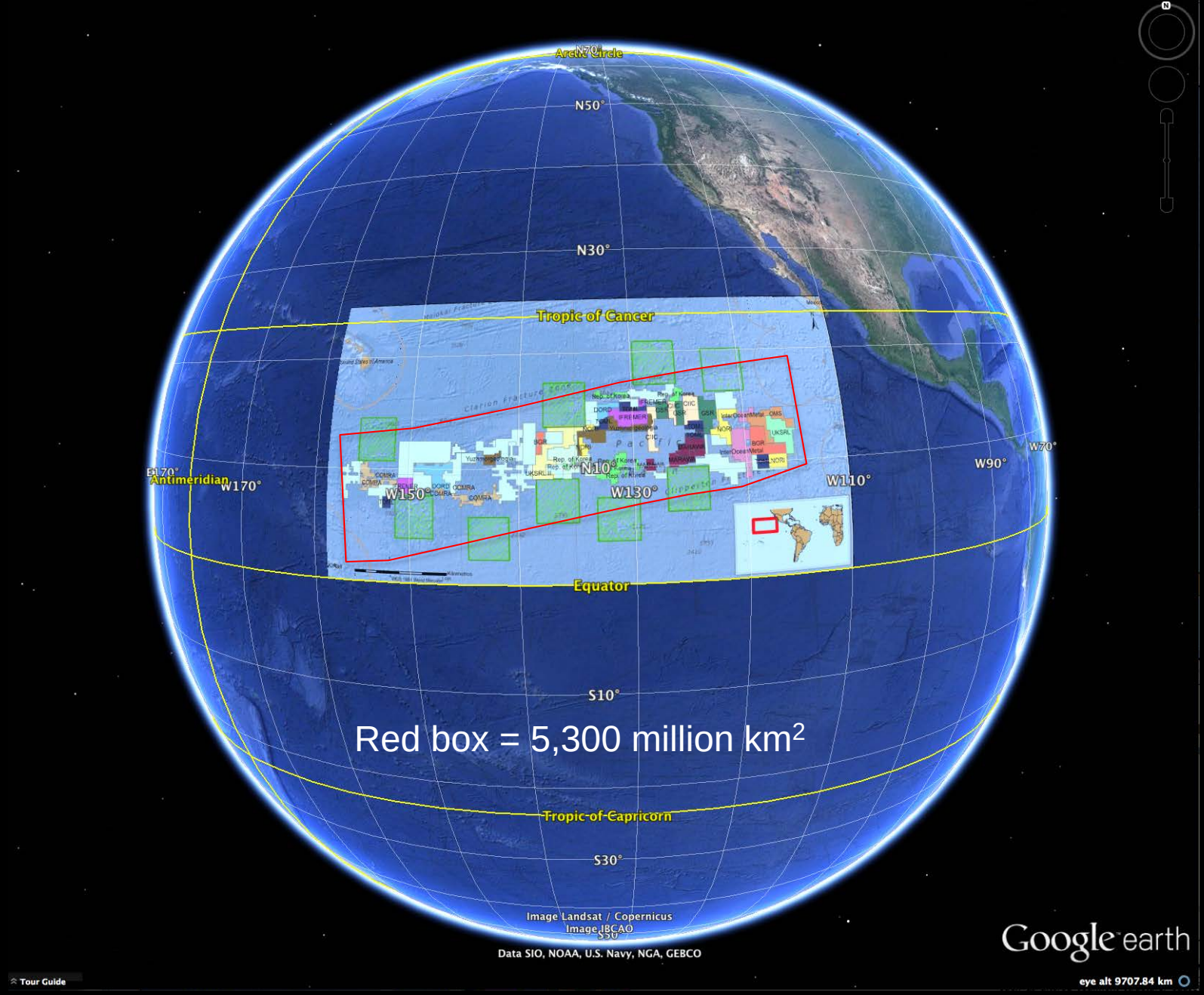


Nine "Areas of Particular Environmental Interest"

The Goals of the CCZ EMP

- Maintain **regional biodiversity, ecosystem structure and ecosystem function** across the Clarion-Clipperton Zone;
- Manage the Clarion-Clipperton Zone consistent with **the principles of integrated ecosystem-based management;**
- Enable the **preservation of representative and unique** marine ecosystems; and
- **Monitor the environment** during and after testing of collecting systems and equipment…

➢**These goals need to be achieved in the regulations and procedures**



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