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Environmental knowledge for change

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Task 6: Environmental Analysis - Highlights

Project FWC MARE/2012/06 – SC E1/2013/04

Client: DG Maritime Affairs and Fisheries

Acknowledgements for current chapter

- Elaine Baker, Yannick Beaudoin, Allison Bredbenner: Editors
- Contributions from: Phil Weaver (Seascape), Eszter Kantor (Ecorys), David Billet (Deep Sea Environmental Solutions)

Additional Sources

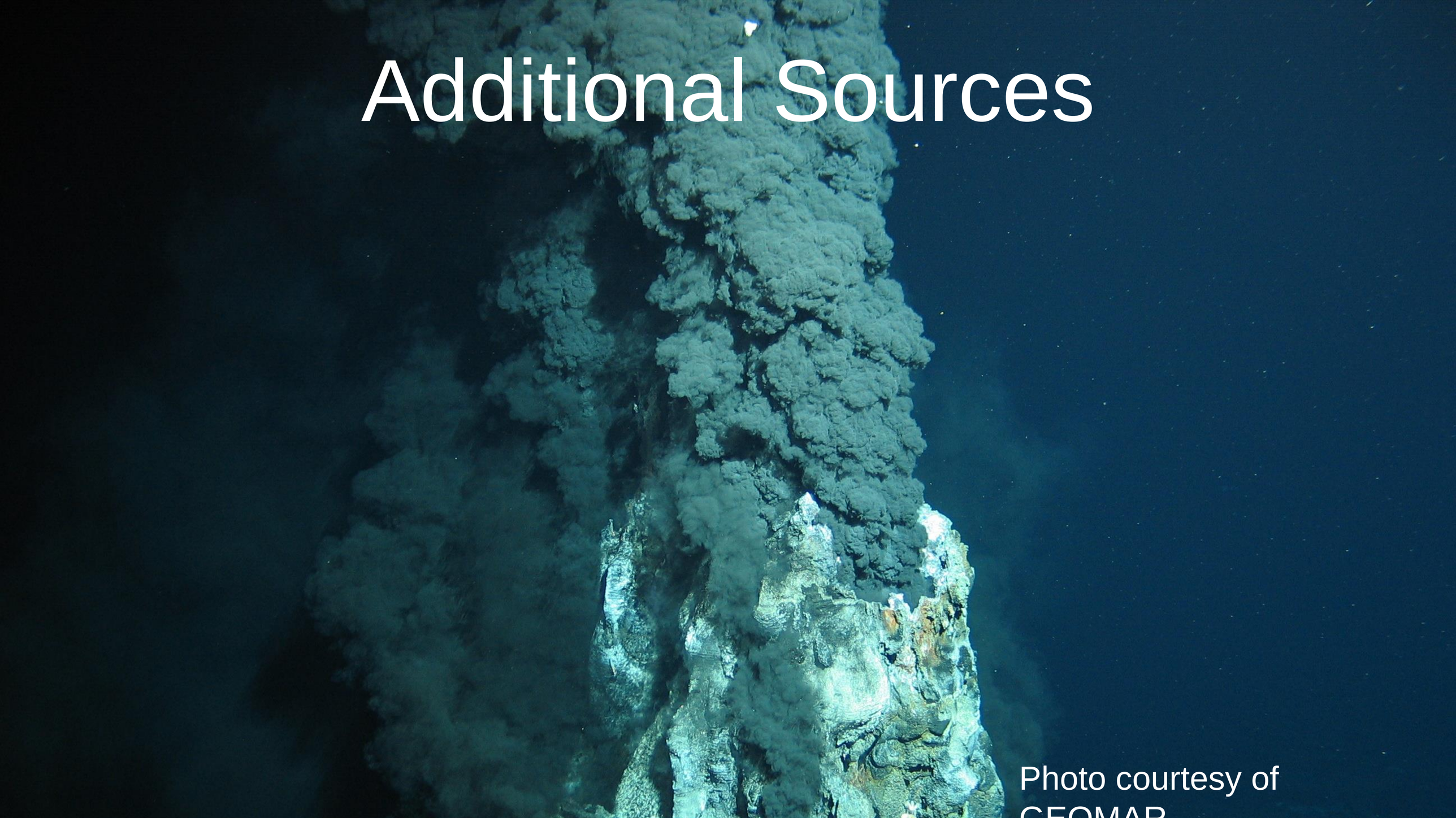

Photo courtesy of GEOMAR

Pacific Marine Minerals and Deep Sea Mining Assessment

SECRETARIAT OF THE PACIFIC COMMUNITY
SECRÉTARIAT GÉNÉRAL DE LA COMMUNAUTÉ DU PACIFIQUE

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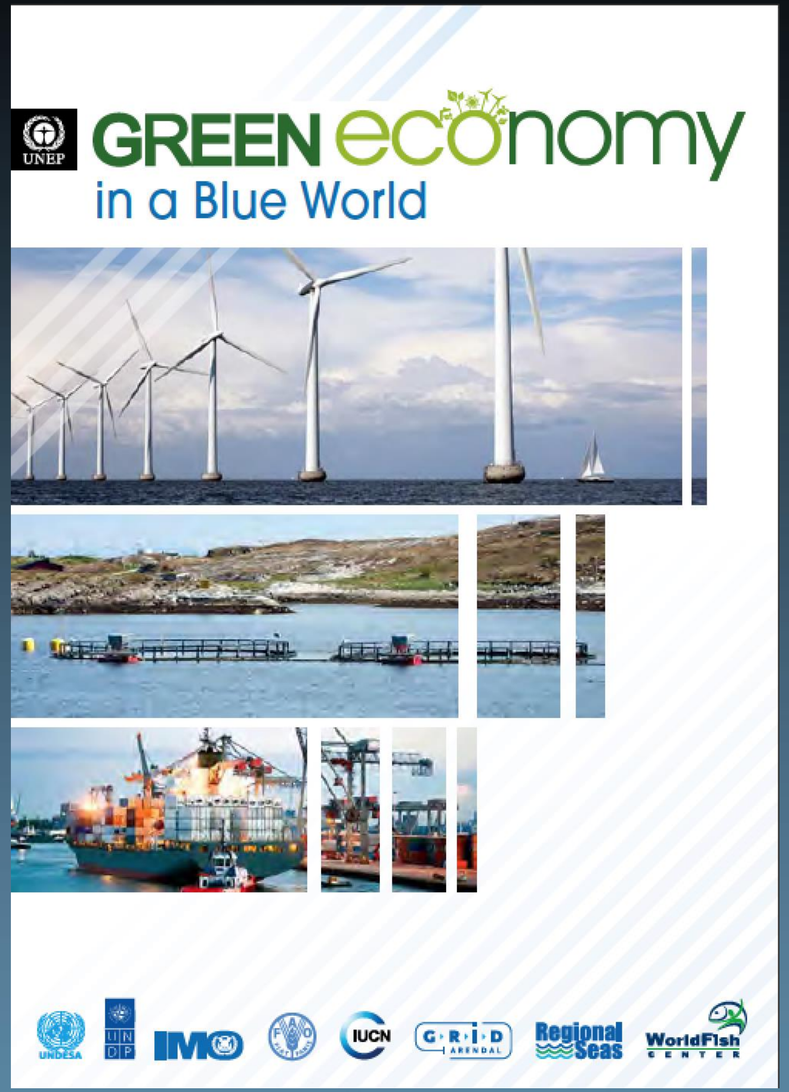
UNEP

UNEP Green Economy in a Blue World



Starting Point

Why deep sea mining?

- What do you feel is meant to be achieved from a societal benefits perspective?
- Is that particular change/development truly desirable?
- What do you feel we need to do now in relation to this topic?
- Who do you feel would gain and who do you think might feel a sense of loss with respect to potential deep sea mining?

Highlights of Environmental Analysis

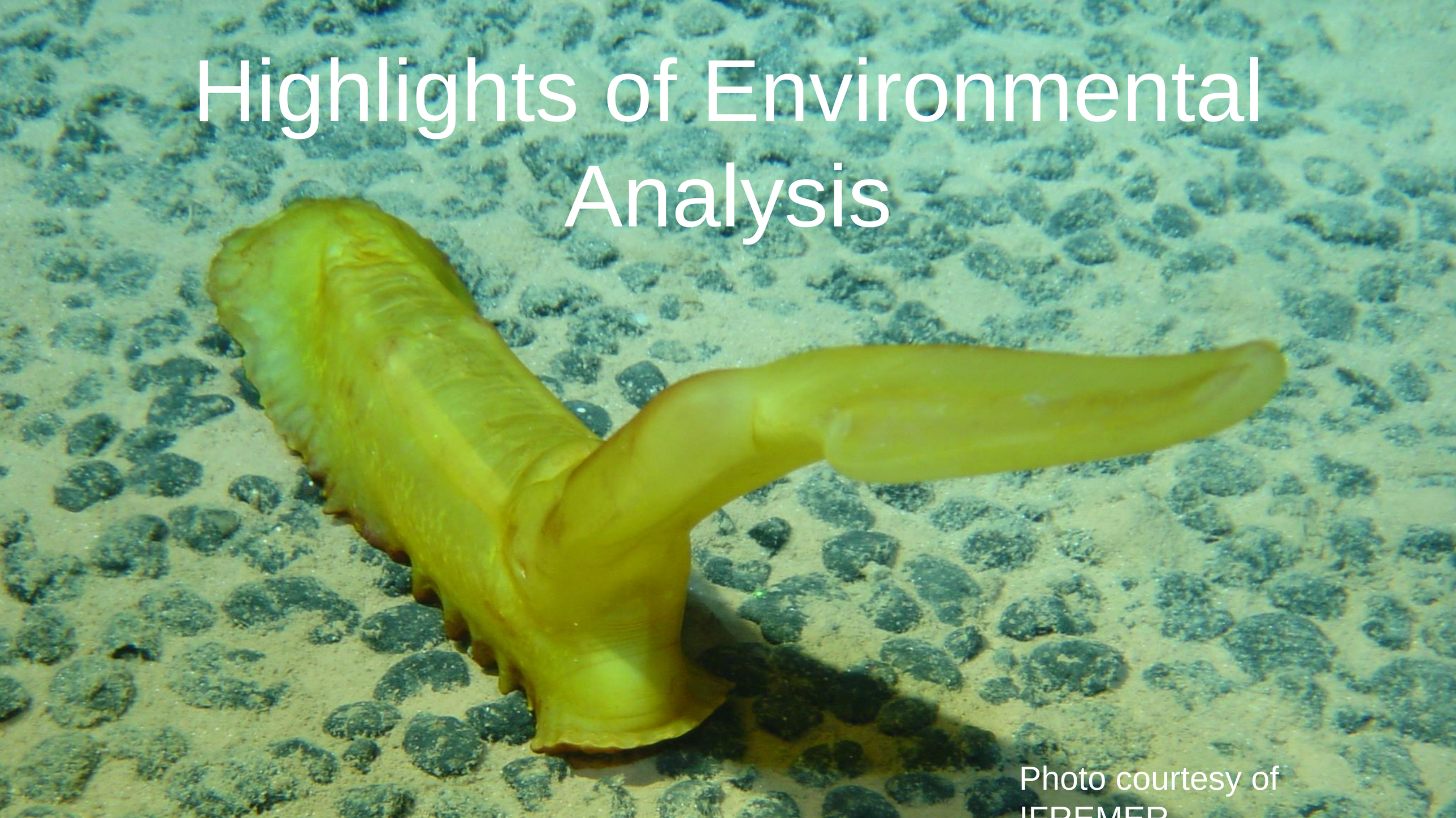


Photo courtesy of IFREMER

Types of impacts on the environment

Destruction of habitat

Sediment laden plumes near seabed containing particle load and potentially chemical toxins

Sediment laden plumes in water column containing particle load and chemical toxins

Size and ecosystem function; impact on life

Noise

Tailings disposal on land/sea

- *impact from dislodging minerals* which includes the physical removal of organisms, rock and sediment;
- *impact from a sediment plume* that generally accompanies mining activities and can potentially have a spatial extent larger than the mining footprint itself (depending on ocean currents, the amount of sediment removed and the technology used);
- *impact from the dewatering process* which delivers contaminated and potentially highly turbid seawater into the water column; and
- *impact from the operation of the mining equipment.* This includes noise and light (although very little is known about their effects on deep sea organisms), oil spills and leaks from hydraulic equipment, sewage and other contaminants from the ore carriers and support vessels.

From Clark and Smith (2013)

Impacts by deposits type – SMS

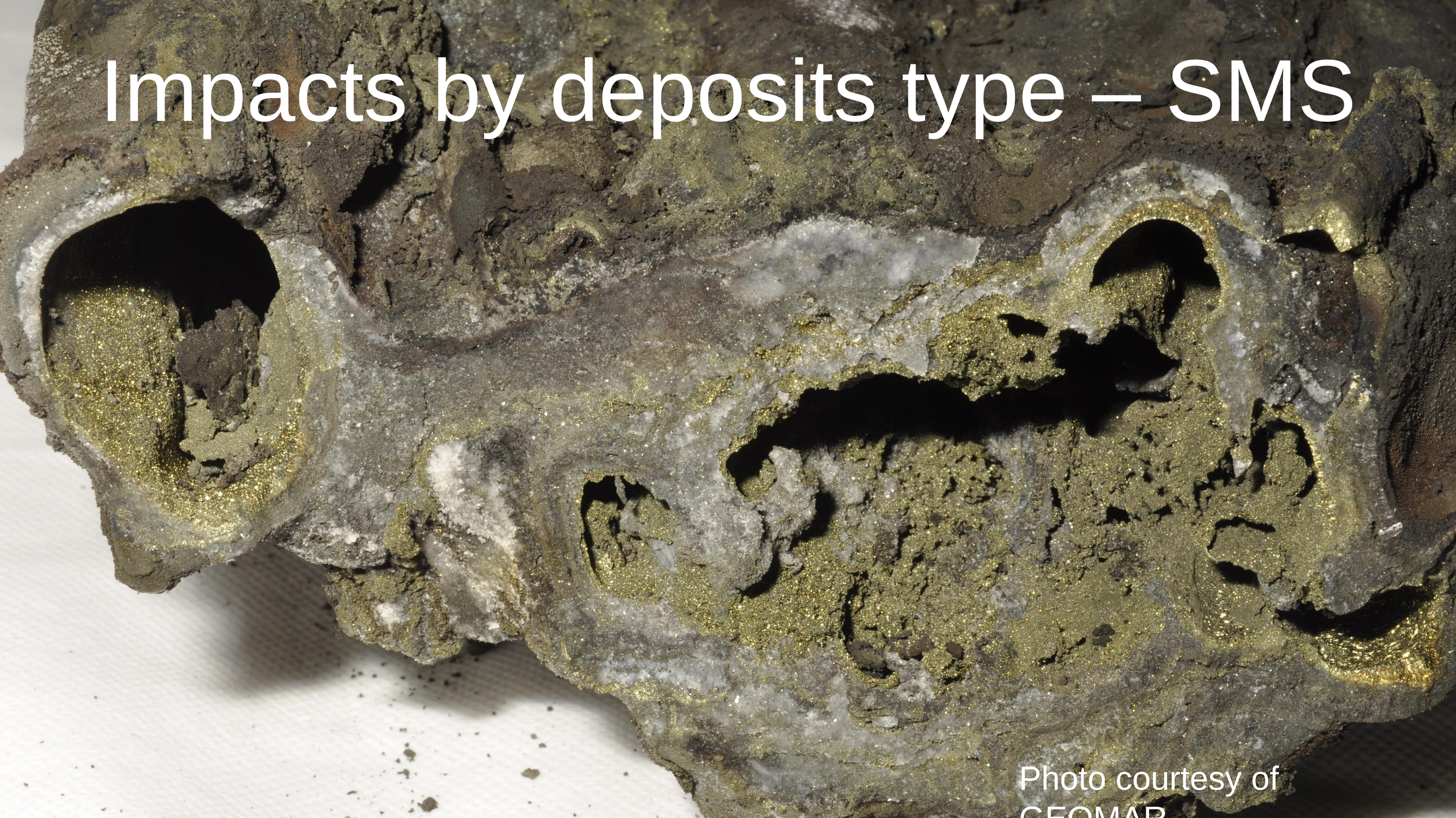
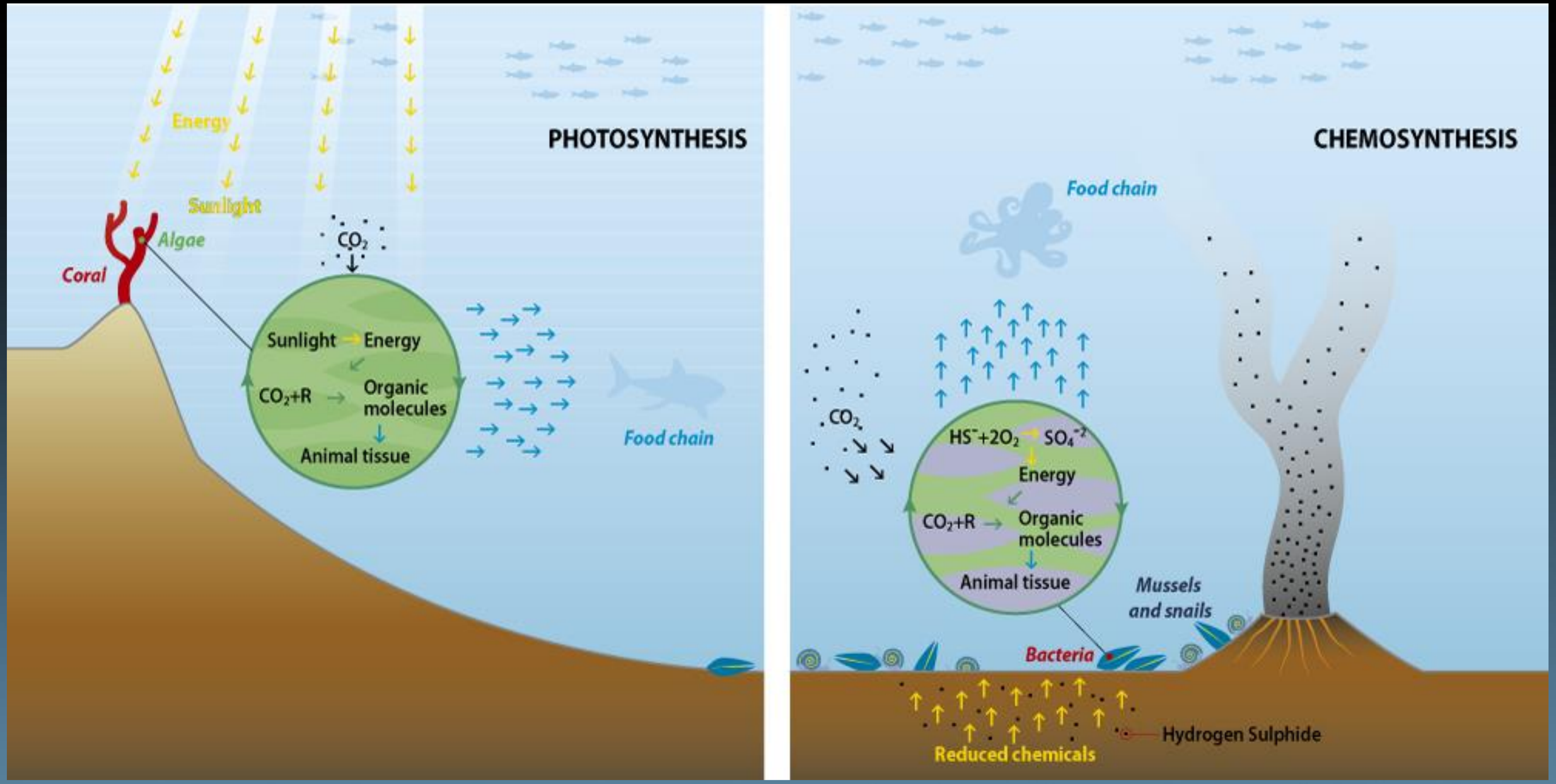


Photo courtesy of GEOMAR



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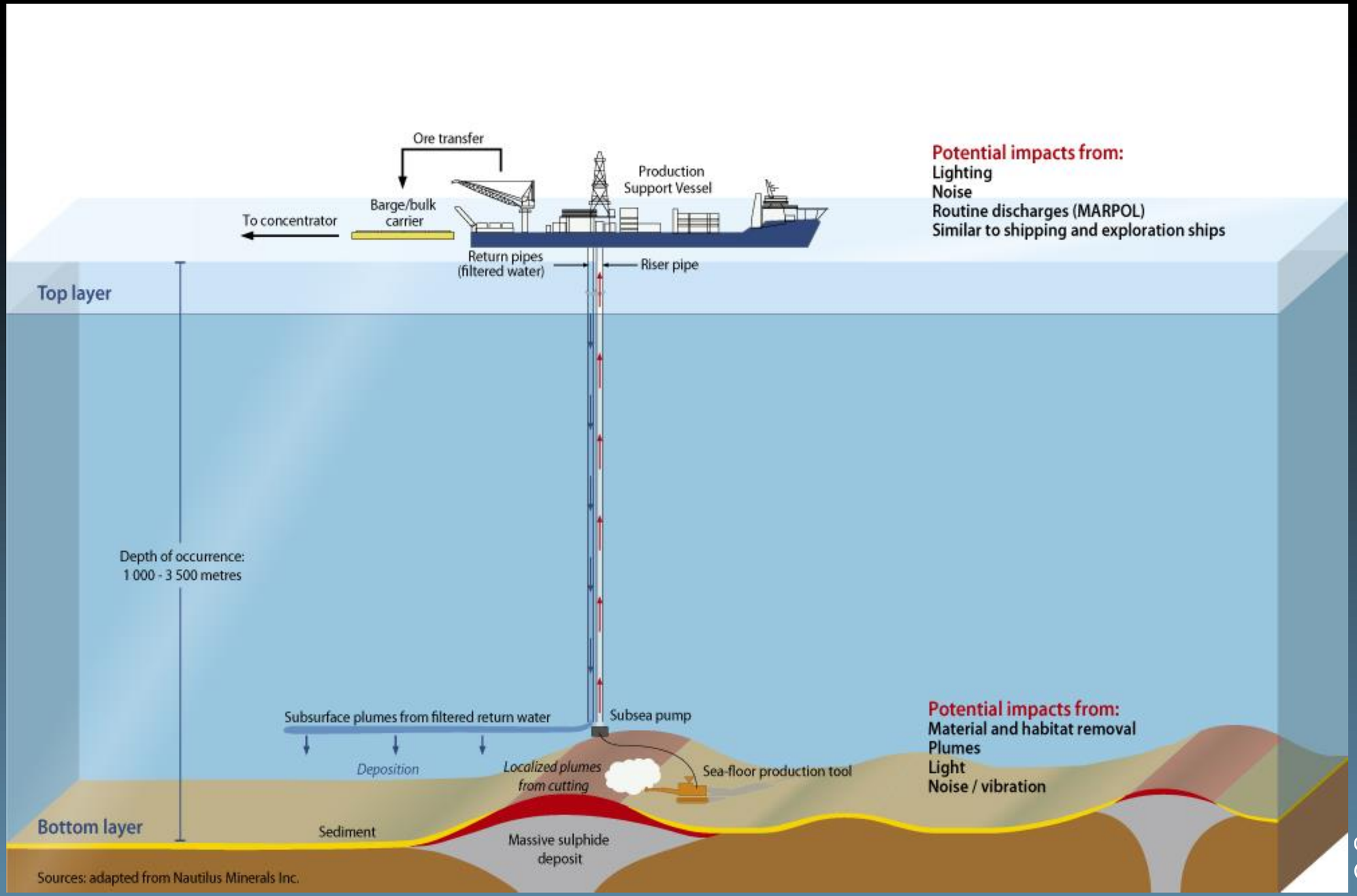

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Sediment laden plumes in water column containing particle load and chemical toxins

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Noise

Tailings disposal on land/sea

Effects of Impacts

On active vent sites maybe relatively short term (months to years). On off-axis vent sites likely to be of longer term - probably tens to hundreds of years

Recovery from the particulates will probably take a few years. In the off-axis vents recovery from chemical pollution may take tens to hundreds of years

Recovery will be rapid once activity ceases

These effects may be long lasting as background sedimentation rates are low.

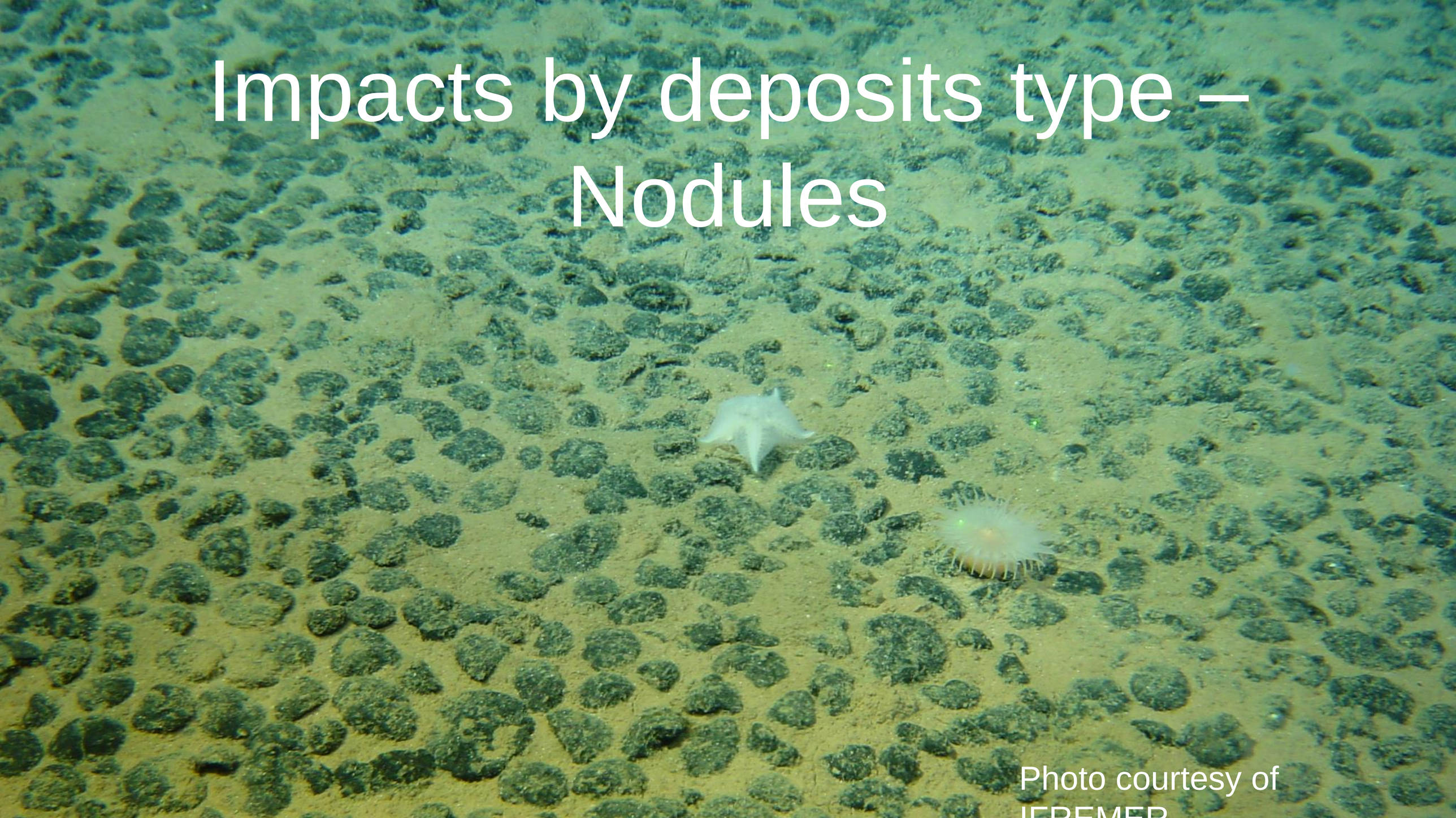
Recovery will be immediate once activity ceases

Long term potential for contamination; similar to land based impacts

Land vs Marine - SMS

Land disturbance	Large area of disturbance both at the mine (open cut and underground). Some disturbance associated with infrastructure such as roads, concentrator, smelter. Mine life can be measured in decades.	Limited spatial extent but destruction of site-specific habitats, limited and reusable infrastructure. Short mine life.
Waste generation	Large amounts of waste including waste rock, tailings, effluent (potential for acid mine drainage), air pollution, potential oil/chemical spills.	No or little overburden, limited tailings (in comparison to land based deposits), waste-water plumes which have the potential to transport toxic substances, limited air pollution from vessels, potential oil/chemical spills.
Biodiversity loss	Total biodiversity loss over a large spatial scale at open cut mines.	Total biodiversity loss at sites of extraction and areas immediately adjacent.
Rehabilitation potential	Major changes to landscape and hydrological regime, but good potential for general rehabilitation over decades to centuries.	Major changes to seafloor topography but on limited spatial scale. In theory, potential of development of healthy (but potentially different) communities over years to decades.

Impacts by deposits type – Nodules



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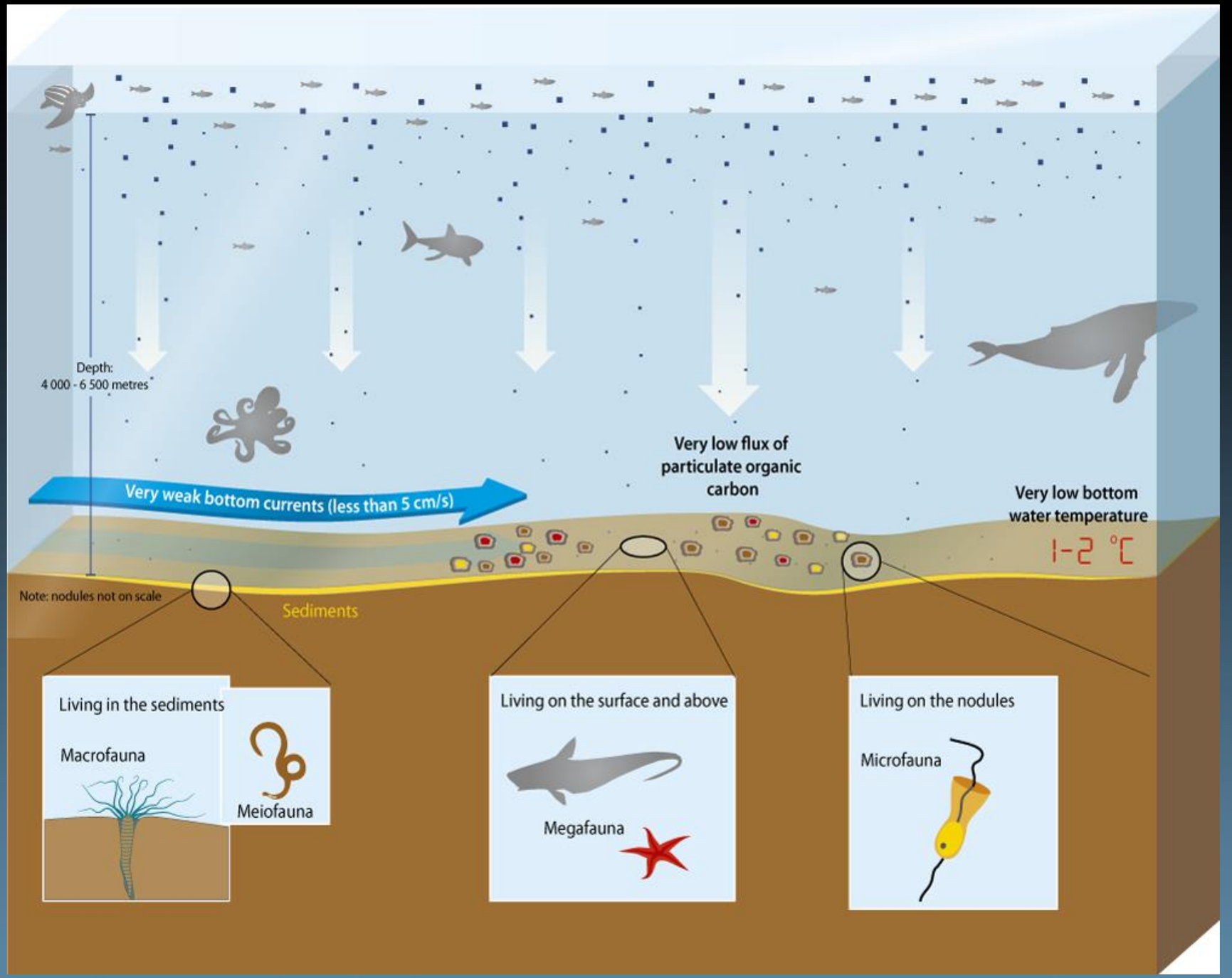

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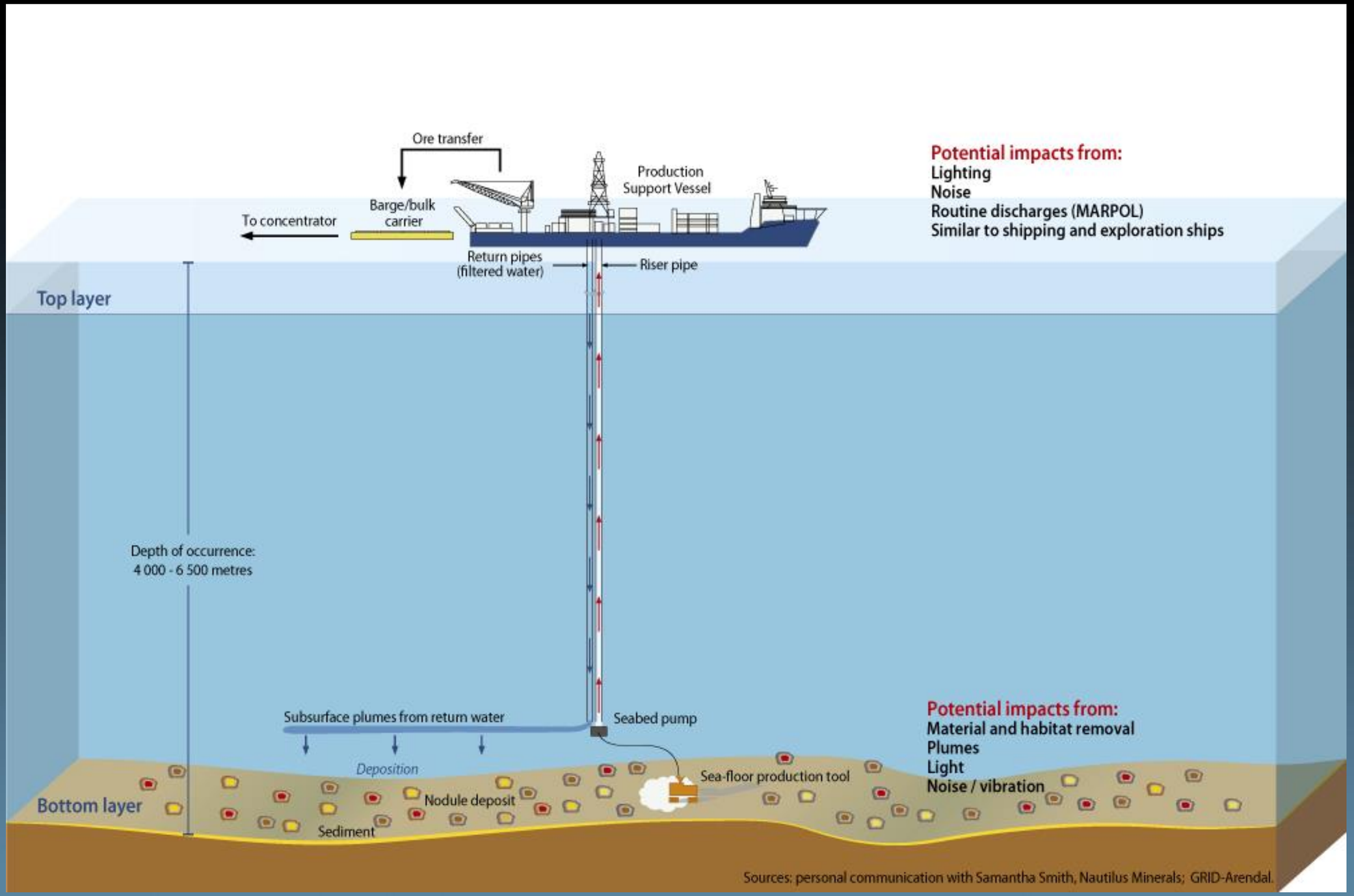


courtesy of GRID-Arendal

Types of impacts on the environment

Destruction of habitat

Sediment laden plumes near seabed containing particle load and potentially chemical toxins

Sediment laden plumes in water column containing particle load and chemical toxins

Size and ecosystem function; impact on life

Noise

Tailings disposal on land/sea

Effects of Impacts

Likely to be extremely slow. For the substrate - may take tens to hundreds of years or even longer in heavily mined areas. For the nodule faunas will take millions of years.

Likely to be slow especially in areas heavily impacted by plume fallout. Elsewhere may take tens of years

Recovery will be rapid once activity ceases

These effects may be long lasting as background sedimentation rates are low..

Recovery will be immediate once activity ceases

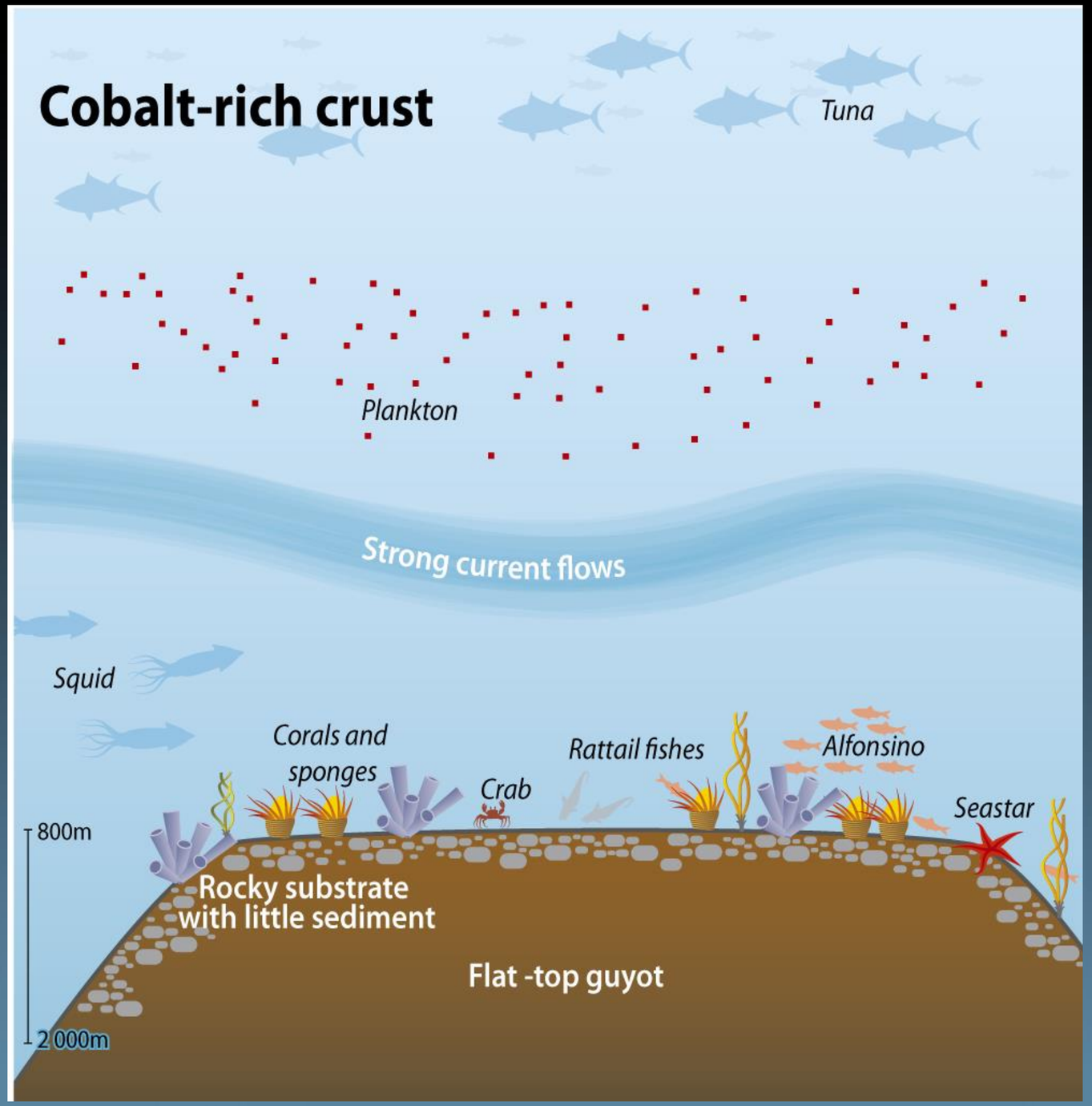
Long term potential for contamination; similar to land based impacts

Land vs Marine - Nodules

Land disturbance	Large area of disturbance both at the mine (open cut and underground). Some disturbance associated with infrastructure such as roads, concentrator, smelter. Mine life can be measured in decades.	Large area of disturbance of benthic layer at mined areas and potentially areas adjacent. Potentially short mine life.
Waste generation	Large amounts of waste including waste rock, tailings, effluent, air pollution, potential oil/chemical spills.	No overburden, limited tailings (in comparison to land based deposits), some waste-water discharged as a plume which may disperse considerable distance, limited air pollution, potential oil/chemical spills.
Biodiversity loss	Total biodiversity loss over a large spatial scale at open cut mines.	Total biodiversity loss at sites of extraction and potentially areas immediately adjacent.
Rehabilitation potential	Major changes to landscape and hydrological regime, but good potential for general rehabilitation over decades to centuries.	Although changes to the seafloor morphology may be limited, current scientific evidence indicates that there is likely to be very poor rehabilitation potential within human time scales.

Impacts by deposits type – Crusts

Photo courtesy of J. Hein, USGS



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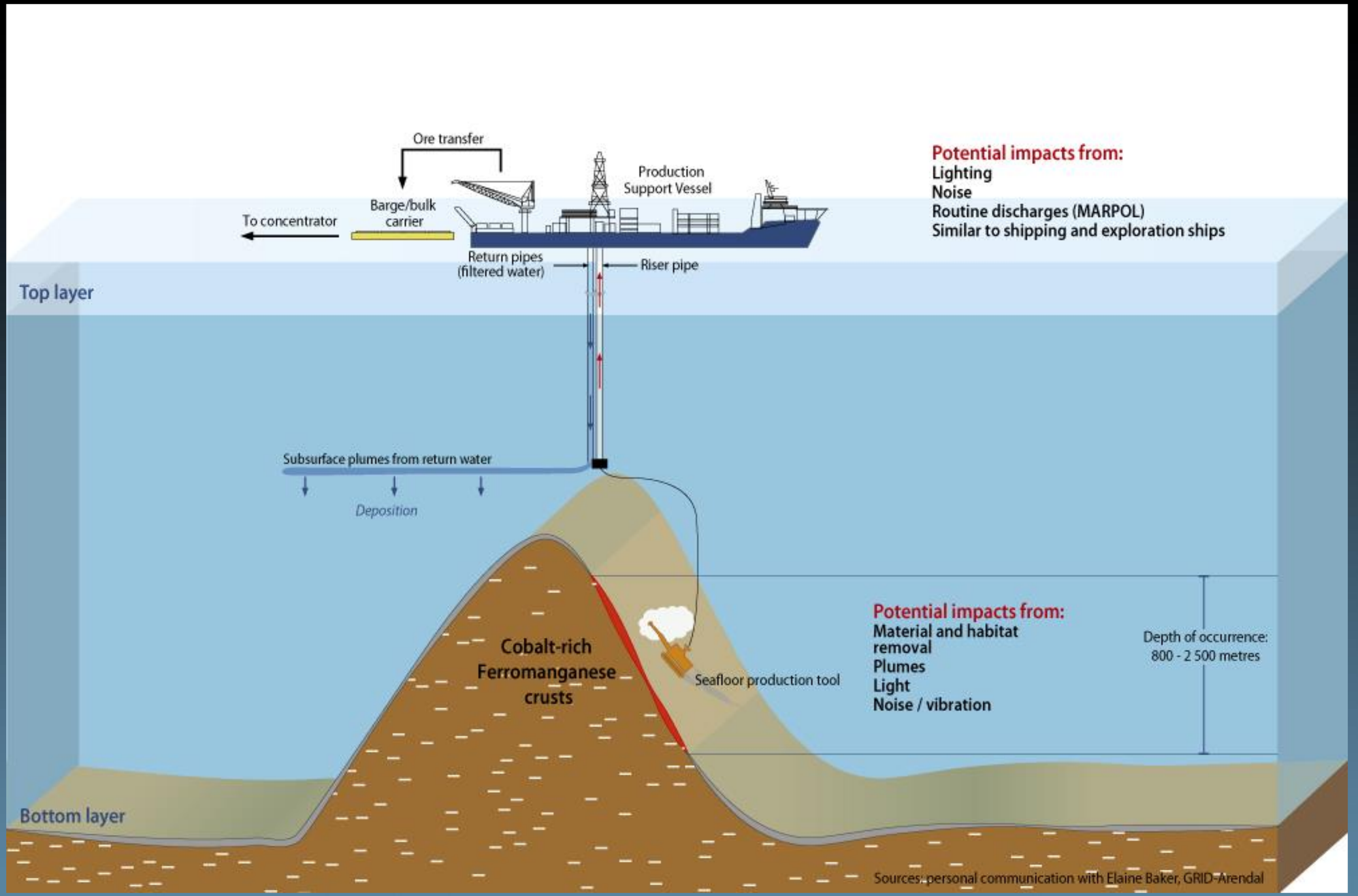

Ore transfer
Production Support Vessel
Barge/bulk carrier
To concentrator
Return pipes (filtered water)
Riser pipe
Potential impacts from:
Lighting
Noise
Routine discharges (MARPOL)
Similar to shipping and exploration ships
Top layer
Subsurface plumes from return water
Deposition
Cobalt-rich Ferromanganese crusts
Seafloor production tool
Potential impacts from:
Material and habitat removal
Plumes
Light
Noise / vibration
Depth of occurrence: 800 - 2 500 metres
Bottom layer
Sources: personal communication with Elaine Baker, GRID-Arendal

Types of impacts on the environment

Destruction of habitat

Sediment laden plumes near seabed containing particle load and potentially chemical toxins

Sediment laden plumes in water column containing particle load and chemical toxins

Size and ecosystem function; impact on life

Noise

Tailings disposal on land/sea

Effects of Impacts

Likely to be very slow (tens to hundreds of years).

Likely to be very slow (tens to hundreds of years) if epifaunal organisms are impacted on bare rock surfaces

Recovery will be rapid once activity ceases

These effects may be long lasting as background sedimentation rates are low.

Recovery will be immediate once activity ceases

Long term potential for contamination; similar to land based impacts

Land vs Marine - Crusts

Land disturbance	Moderate area of disturbance both at the mine. Some disturbance associated with infrastructure such as roads, concentrator, smelter. Mine life can be measured in decades.	Spatial area of a commercial a mine is currently undefined, but could be significant and on a larger spatial scale than on land mining.
Waste generation	Large amounts of waste including waste rock, tailings, effluent, air pollution, potential oil/chemical spills.	No overburden, the limited tailings dealt with on land, some waste-water discharged as a plume, which may spread considerable distance, limited air pollution.
Biodiversity loss	Total biodiversity loss over a large spatial scale at open cut mines.	Total biodiversity loss at sites of extraction and potentially areas immediately adjacent.
Rehabilitation potential	Major changes to landscape and hydrological regime, but good potential for general rehabilitation over years to decades.	Major changes to substrate, slow recovery over tens to hundreds of years. May never fully recover in some areas of altered substrate.

Roadmap to establishing GES

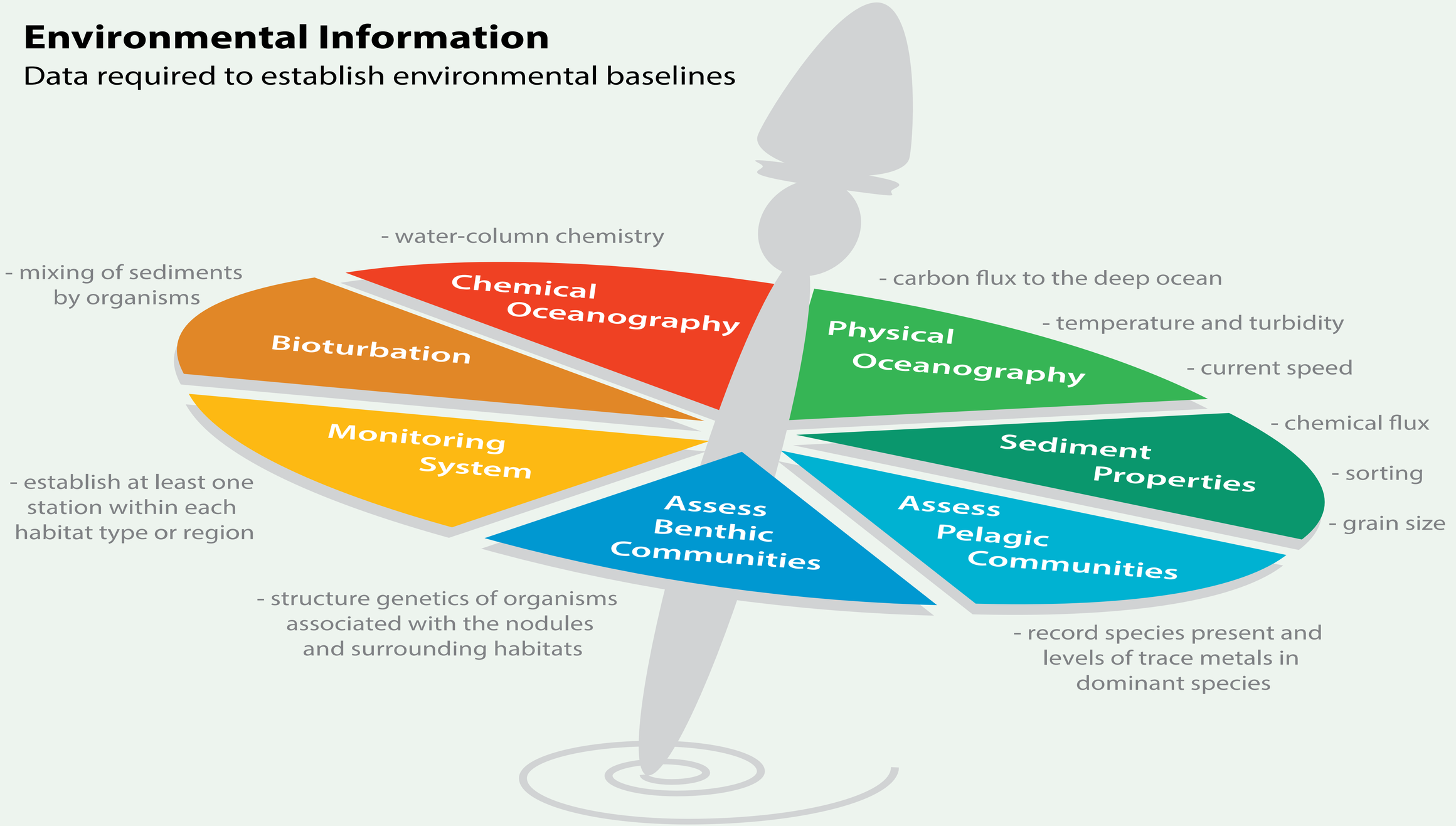
Photo courtesy of Y. Beaudoin


Policy/communication
Aspects: environment, technology, etc
Operational objectives
Implementation
Monitor and review

Step 1: Gathering raw data on deposits and ecology
Description:
Cost and benefit estimation:
Recommendations for implementation:
Step 2: Transparency of information exchange
Description:
Cost and benefit estimation:
Recommendations for implementation:
Step 3: Common indicators for technology assessment
Description:
Cost and benefit estimation:

Environmental Information

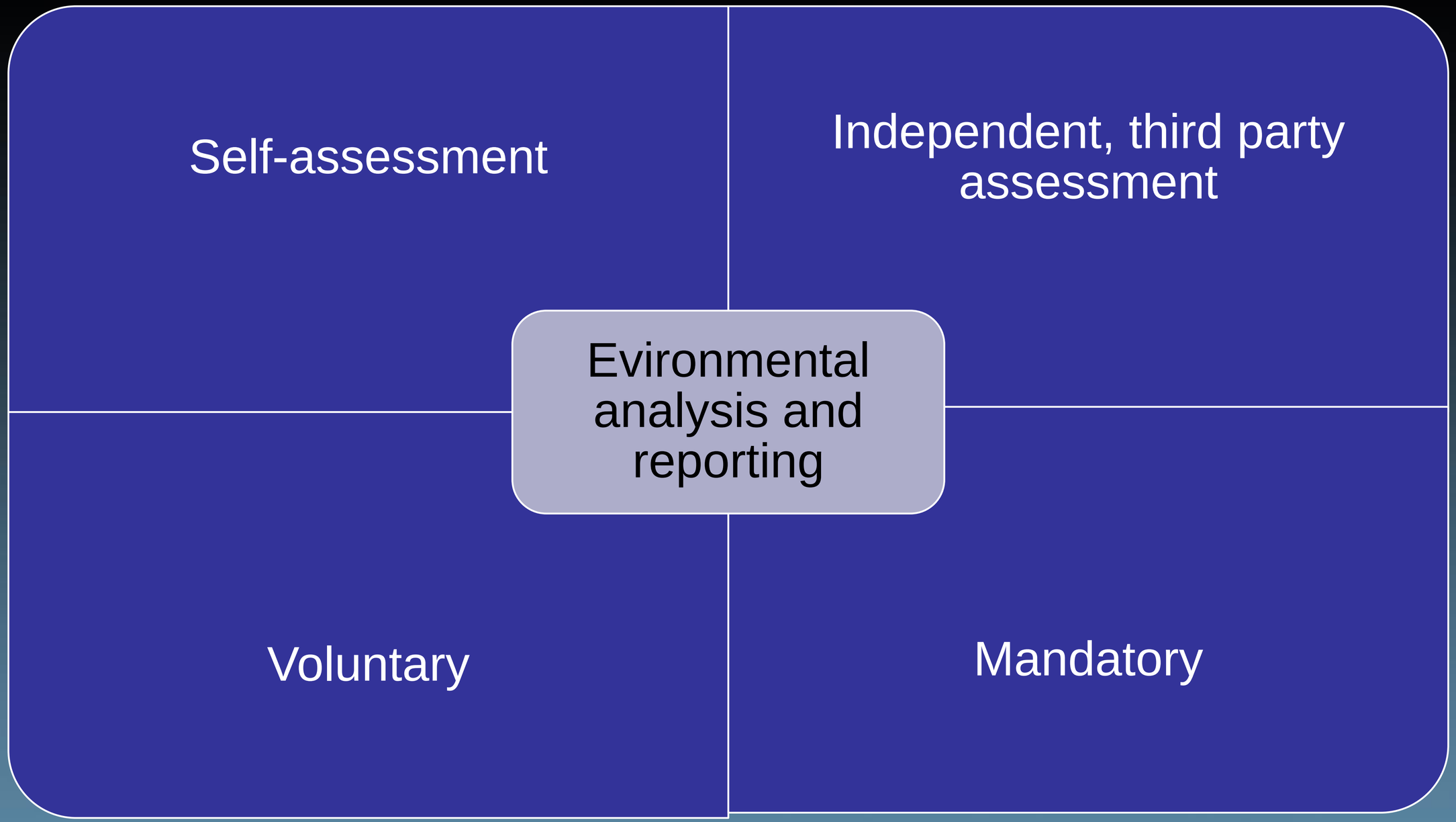
Data required to establish environmental baselines



Source: GRID-Arendal

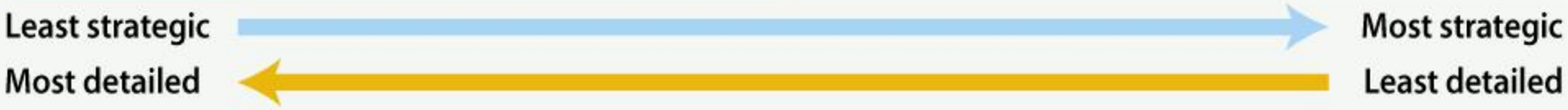
Decision-making tools – Environmental performance

Photo courtesy of Y. Beaudoin


Self-assessment
Independent, third party assessment
Evironmental analysis and reporting
Voluntary
Mandatory

Difference between EIA and SEA

Environmental Impact Assessment of projects	Strategic Environmental Assessment of strategic initiatives
A Technical instrument related to activities with geographic and technical specifications	A Political instrument related to concepts
A Reactive approach - at the end of the decision-making process	A Proactive approach - at earlier stages of the decision-making process
Identifies specific impacts in the environment	Addresses issues of sustainable development
Limited review of cumulative effects	Gives early warning of cumulative effects
Emphasis on mitigating and minimizing impacts	Prevention in terms of identified environmental objectives



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Do you have points to raise?