EASME Initiative: Regional Environmental Management Planning on the Mid-Atlantic Ridge

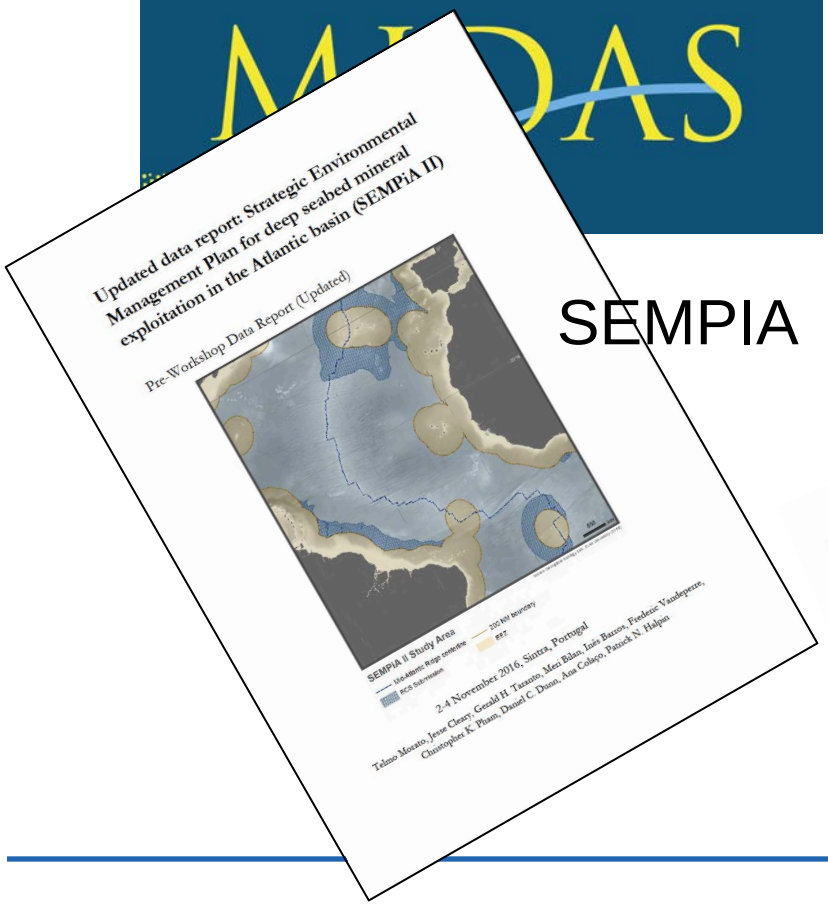
Phil Weaver
Seascape Consultants
Romsey, UK
phil.weaver@seascapeconsultants.co.uk

Kevin Murphy
ERM, UK
Kevin.Murphy@erm.com

ISA meeting Developing a framework for Regional Environmental Management Plans (REMPS) for Polymetallic massive sulphides deposits on Mid-Ocean-Ridges
27-29th June, 2018, Szczecin, Poland

MANAGING IMPACTS OF DEEP-SEA RESOURCE EXPLOITATION

MIDAS



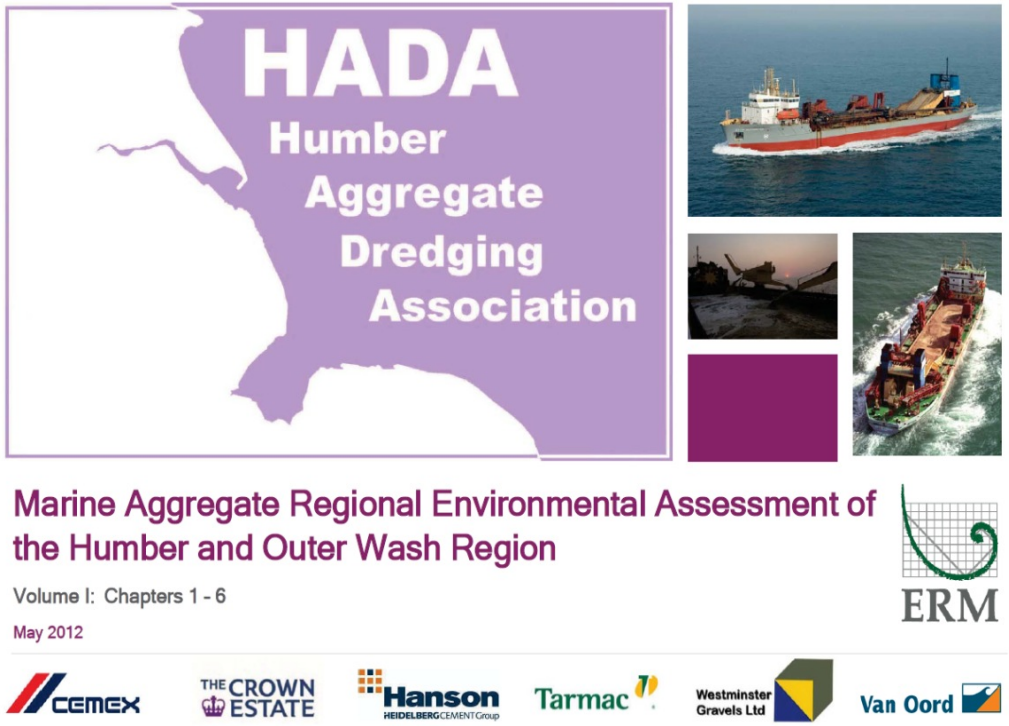
SEMPIA

Blue Nodules
Breakthrough Solutions for the **Sustainable Harvesting** and **Processing** of Deep Sea **Polymetallic Nodules**

seascape consultants ltd

REMP in other sectors Kevin Murphy

Marine Aggregate Regional Environmental Assessments: two (out of five) voluntary exercises by the industry undertaken for the Outer Thames Estuary and Humber and Greater Wash



Regional Environmental Assessment of Oil and Gas E&P in the Arctic Region; REA/REMP for oil and gas E&P in the Caspian Region; REA/REMP for oil and gas E&P in a North African country. All voluntary but confidential.

ERM

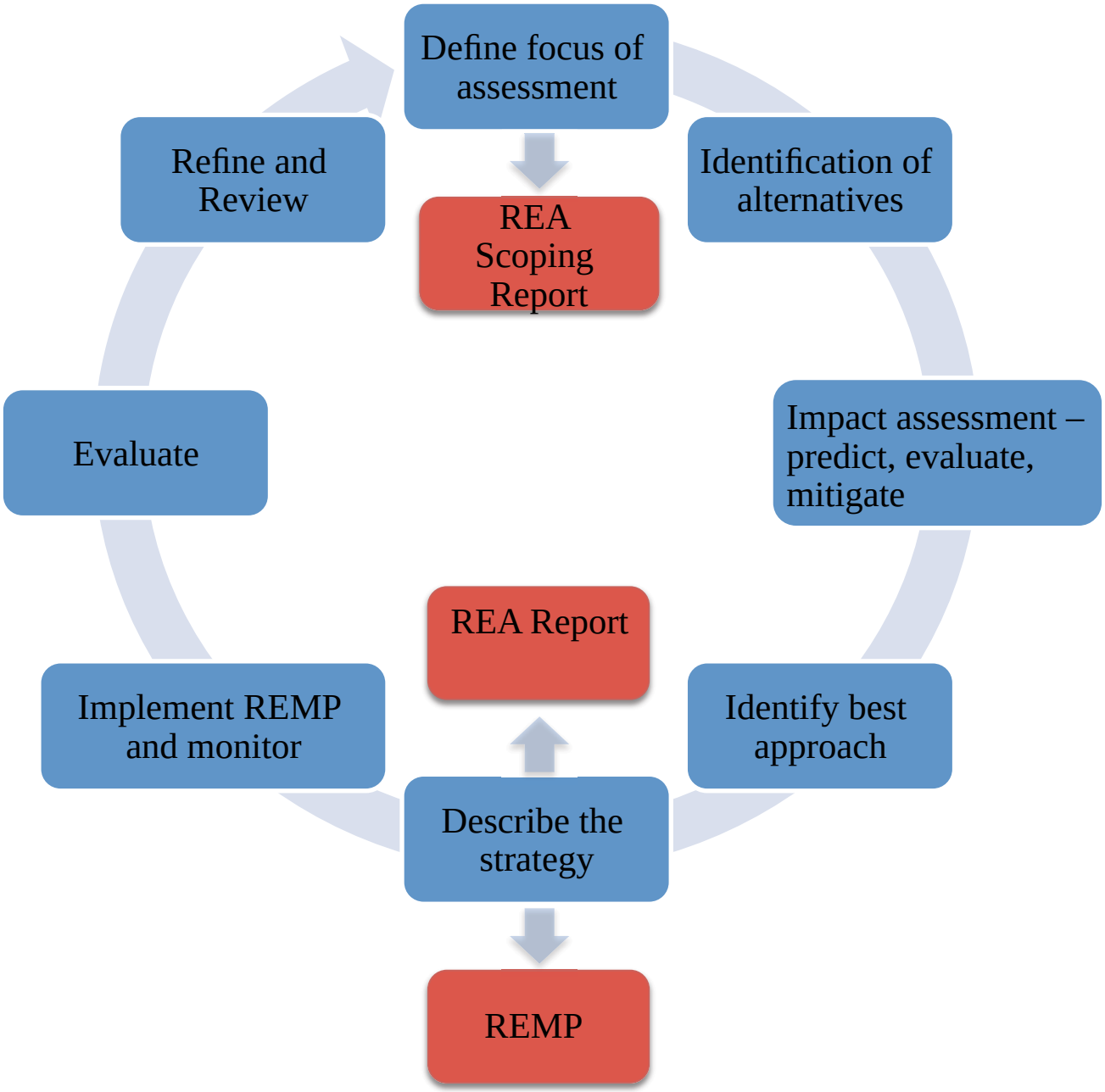
What is a regional Environmental Management Plan?

Regional environmental management planning aims to create and establish a more rational organization of the use of marine space and the interactions between its uses, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives in an open and planned way - *IOC-UNESCO*

Preliminary strategy for the development of REMPs ISBA/24/c/3

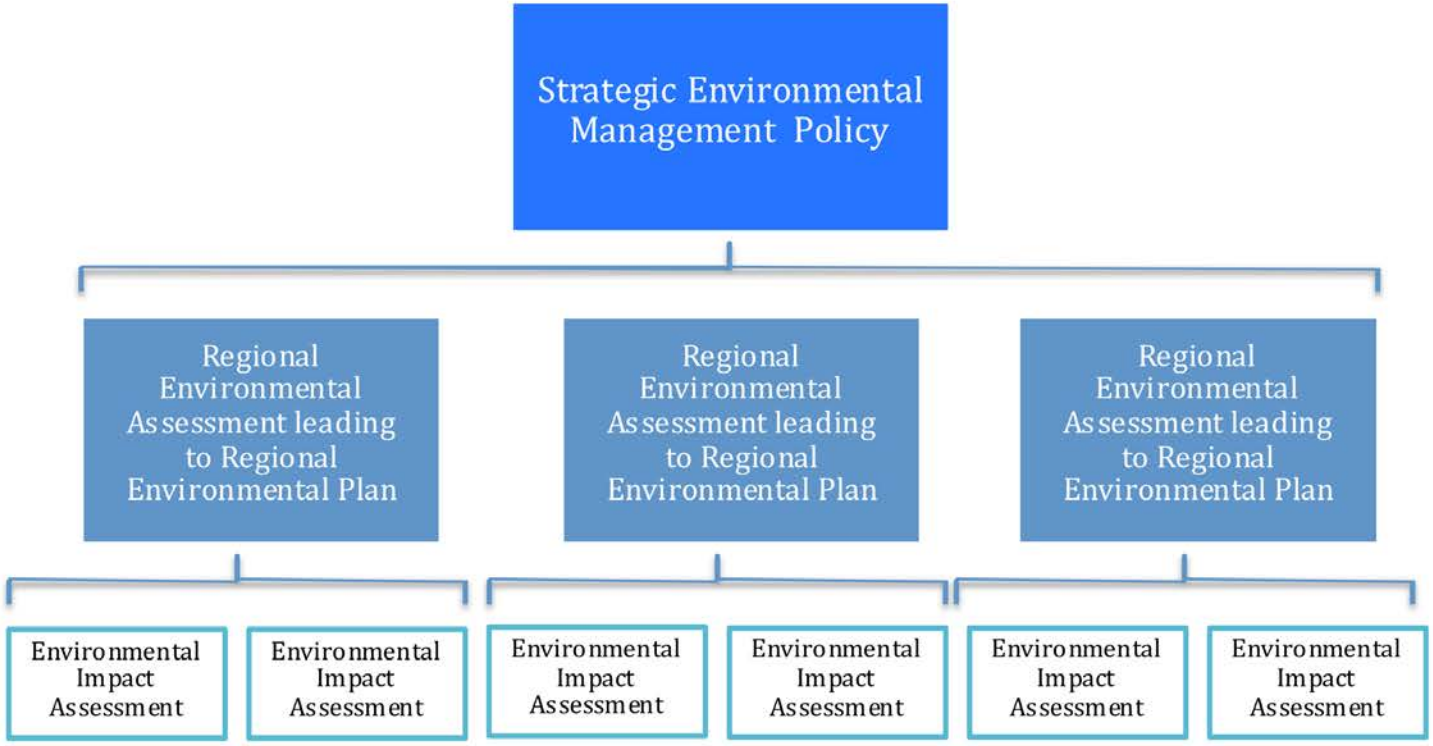
In broad terms, the objective of REMPs is to provide the relevant organs of the Authority, as well as contractors and their sponsoring States, with a proactive area-based management tool to support informed decision-making that balances resource development with conservation.

Regional environmental management plans also provide the Authority with a clear and consistent mechanism to identify particular areas thought to be representative of the full range of habitats, biodiversity and ecosystem structures and functions within the relevant management area, and provide those areas with appropriate levels of protection, thus helping the Authority to meet internationally agreed targets, such as Aichi Biodiversity Target 11.



Modified from Jones Presentation at the ISA's Berlin workshop March, 2017

The ISA led tiered approach to environmental management



Guides overall strategy and mode of operation for the whole of the Area

Regional Environmental assessment and plan developed for each region

Contractors develop EIAs for specific mining projects in line with the regional plan

Modified from Jones and Weaver, ISA Tech Study 17, 2017

Benefits of the Regional Management plan

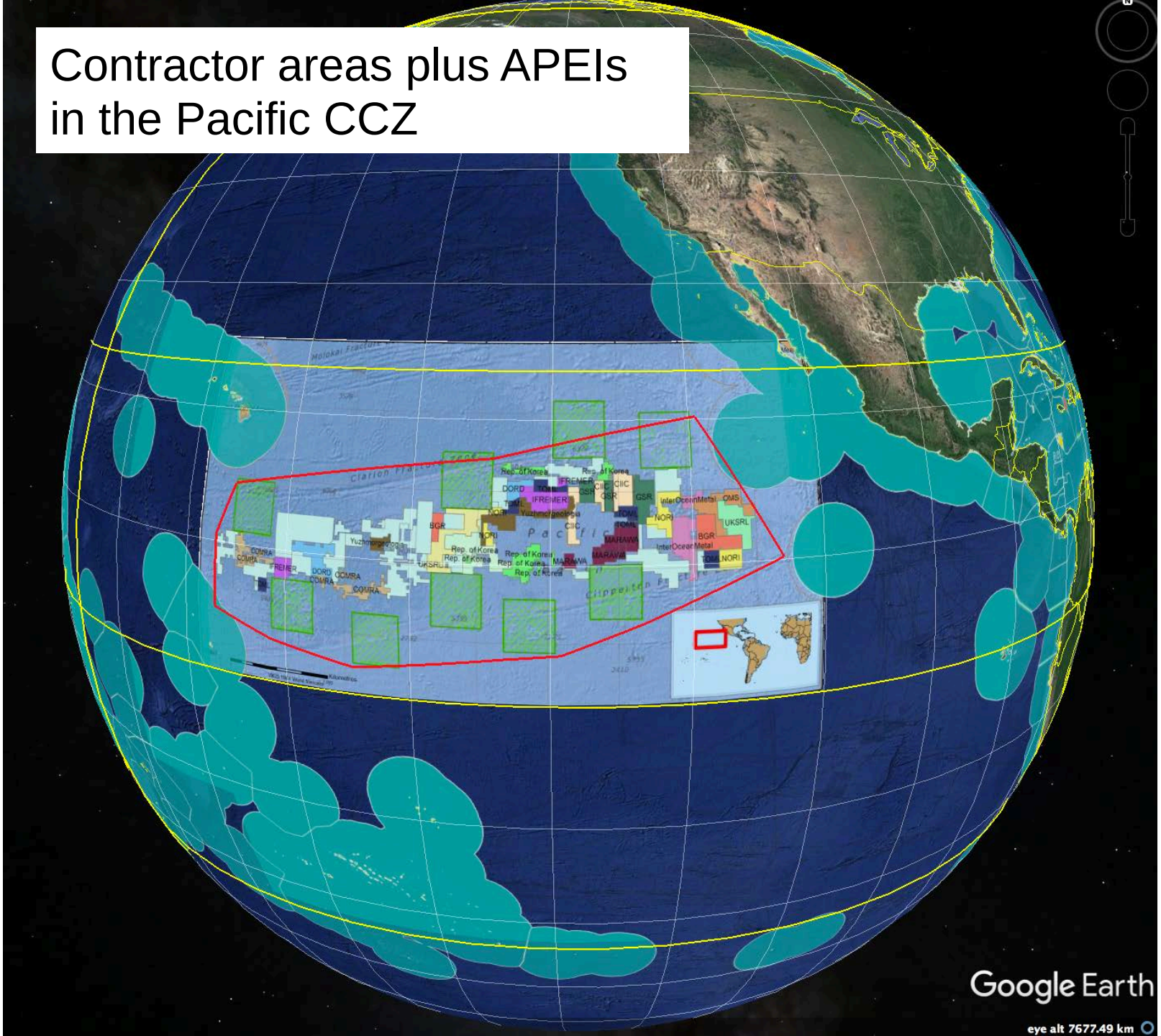
Assist ISA in managing environment regionally	Improve strategic decision-making	Regional-scale understanding
Framework for periodic assessment	Anticipate and understand cumulative or combined impacts	Encourages regular stakeholder input
Improve data consistency + exchange	Provide context info for project scoping EIA, identifies areas to focus on	Provides other input throughout the EIA process

From Jones Presentation at the ISA's Berlin workshop March, 2017

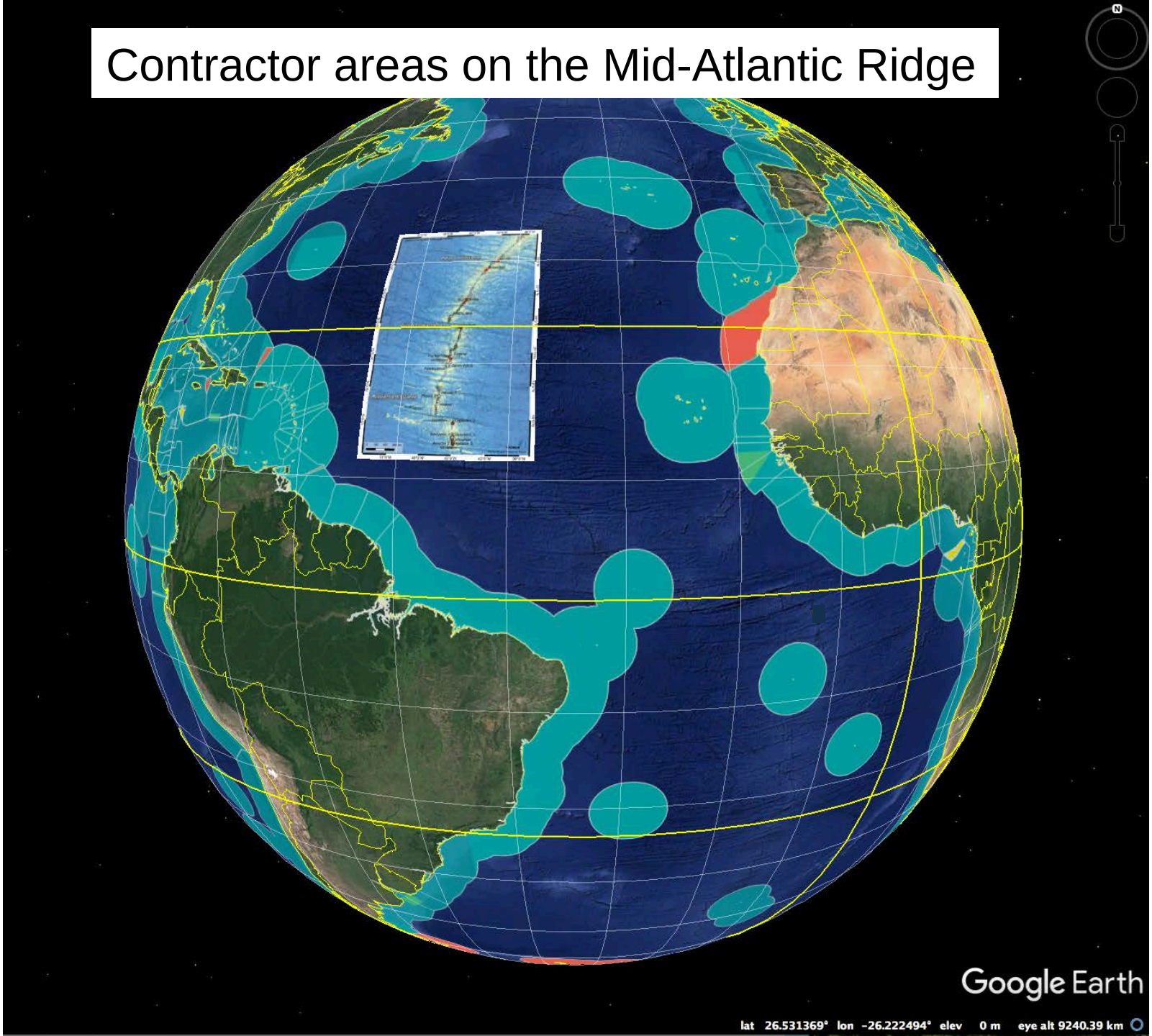
How will a Regional Environmental Management Plan benefit the contractor?

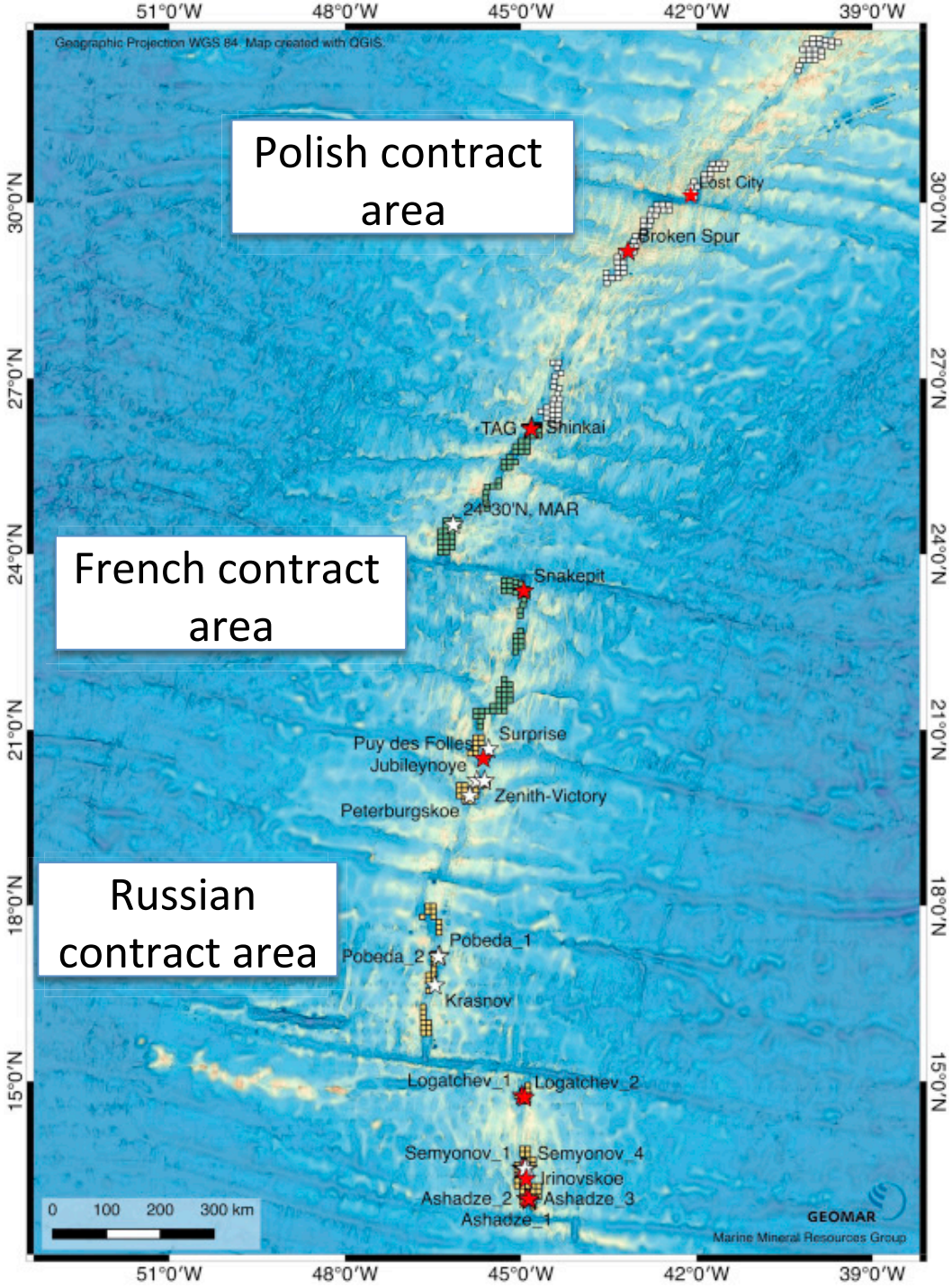
- Enables a wider perspective
- Reduces uncertainty in the planning process
- Reduces potential for conflict between different users
- Reduces environmental impacts
- Determines the scale of the precautionary approach
- Provides an understanding of each contractor’s contribution to cumulative effects
- Reduces the need (and associated cost) to retrofit environmental controls at a later date
- Improves investor confidence

Contractor areas plus APEIs in the Pacific CCZ



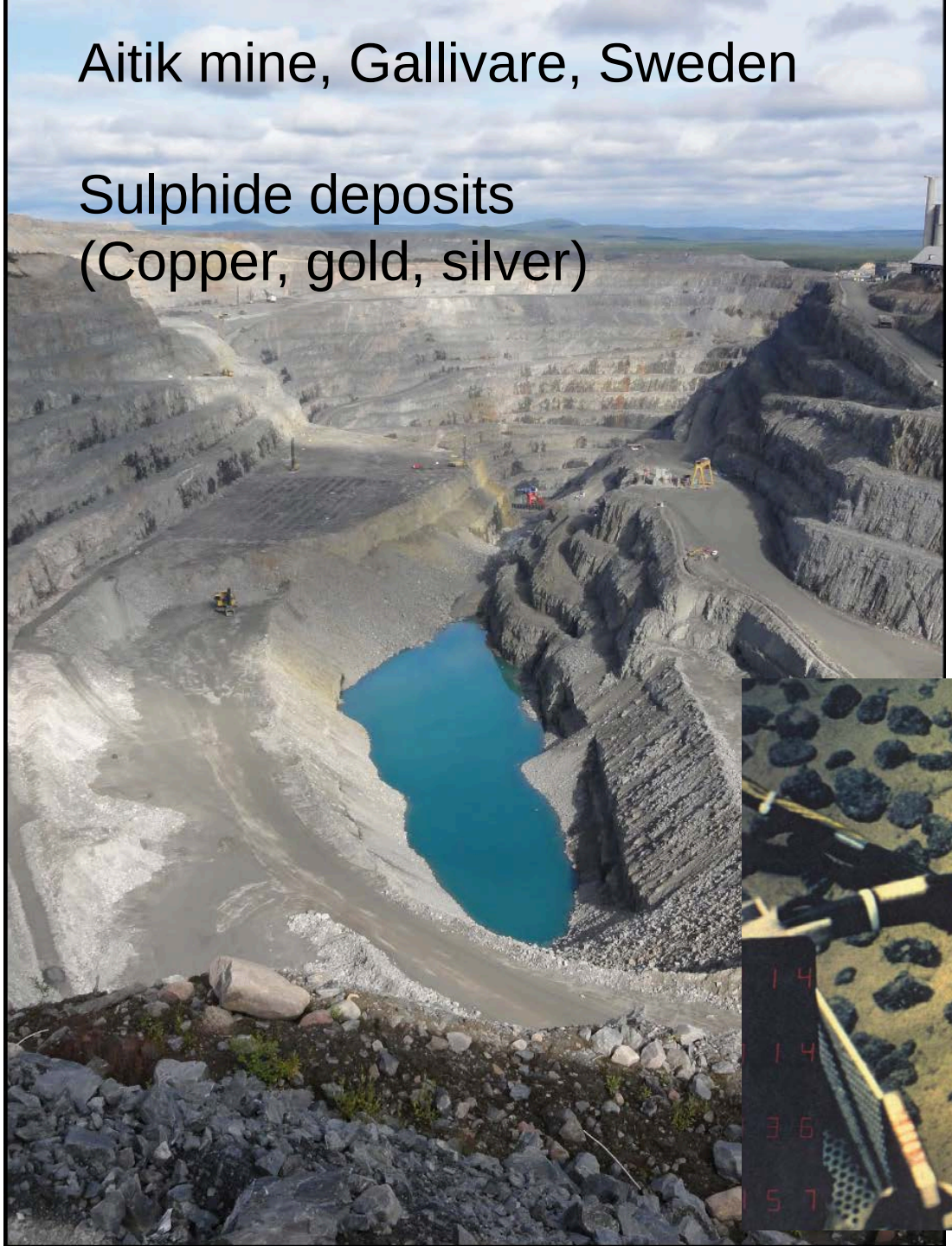
Contractor areas on the Mid-Atlantic Ridge





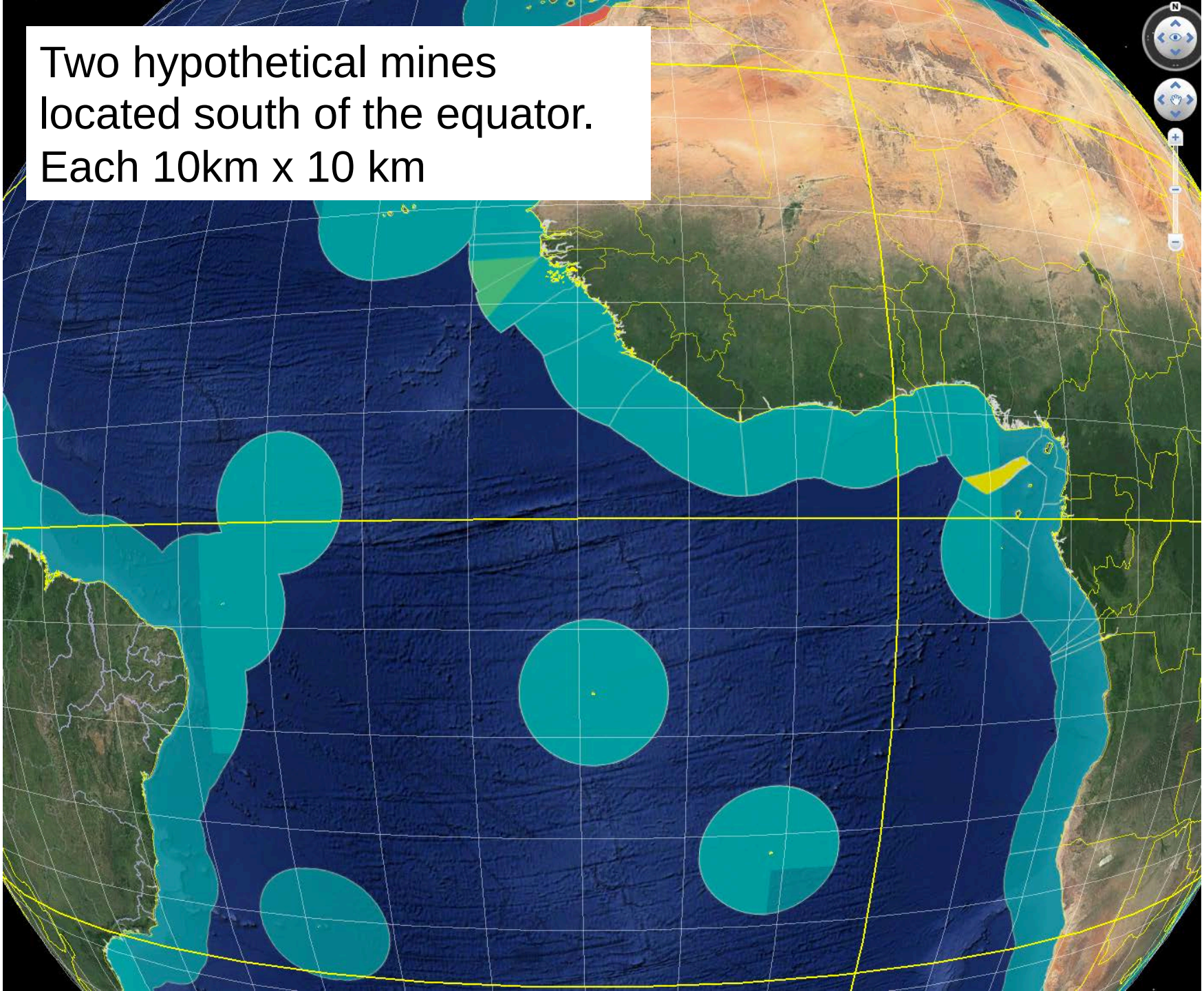
Contractor blocks along the mid Atlantic Ridge

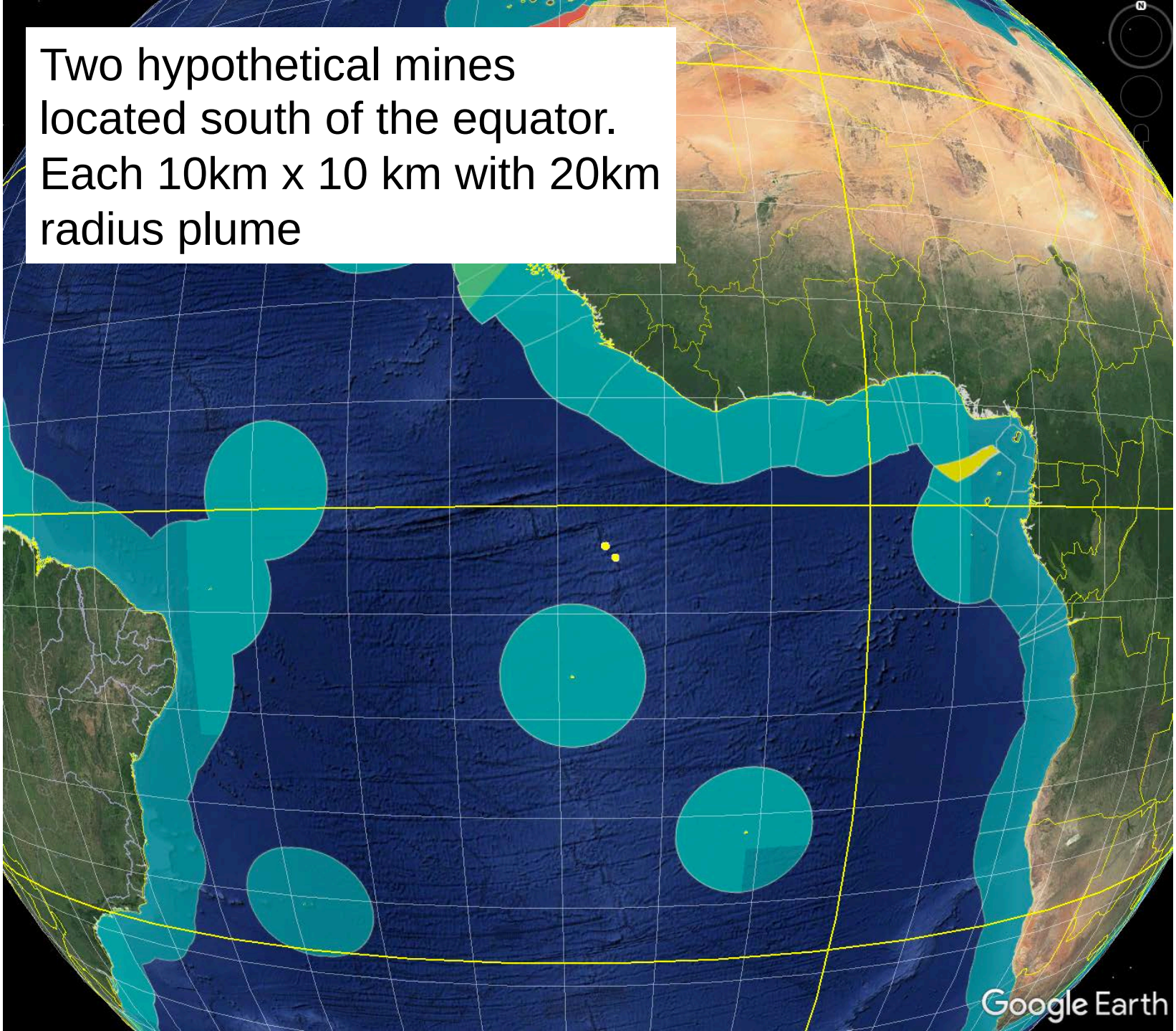
How much mining will there be?



Comparison of sulphide mining with nodule mining

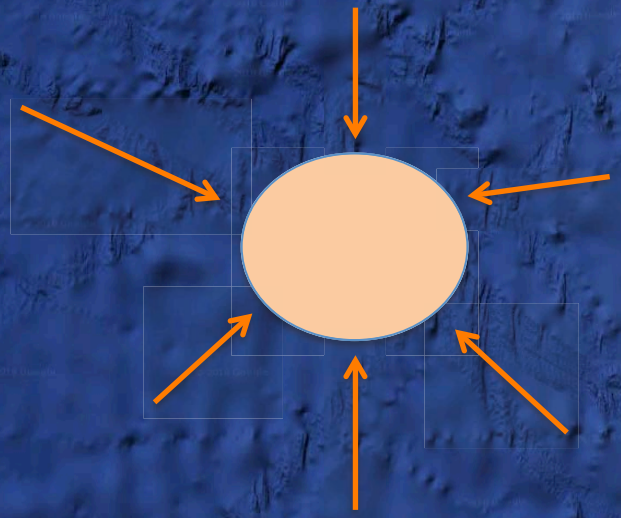
- Excavated area
- Composition and effect of plume


Two hypothetical mines
located south of the equator.
Each 10km x 10 km


Two hypothetical mines located south of the equator. Each 10km x 10 km with 20km radius plume
Google Earth

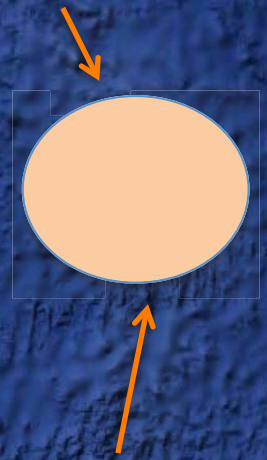
Connectivity along ridges

Seafloor without ridge/vents



Potential for recolonisation from any direction

Seafloor with ridge and vents

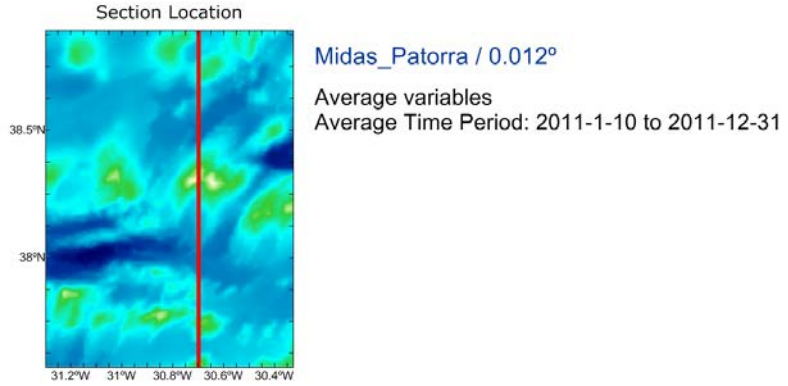


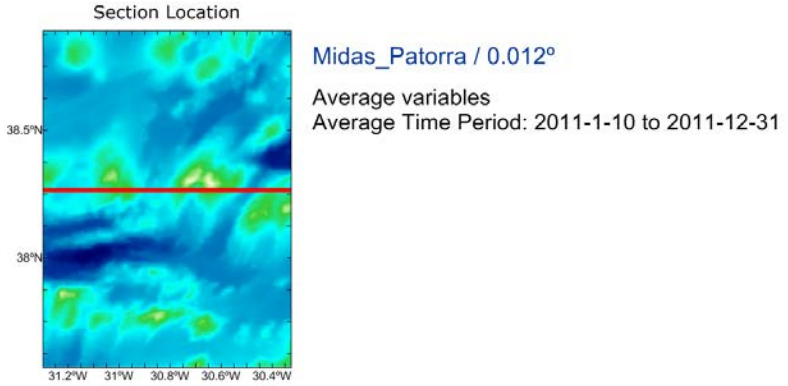
Potential for recolonisation of vent fauna from linear direction

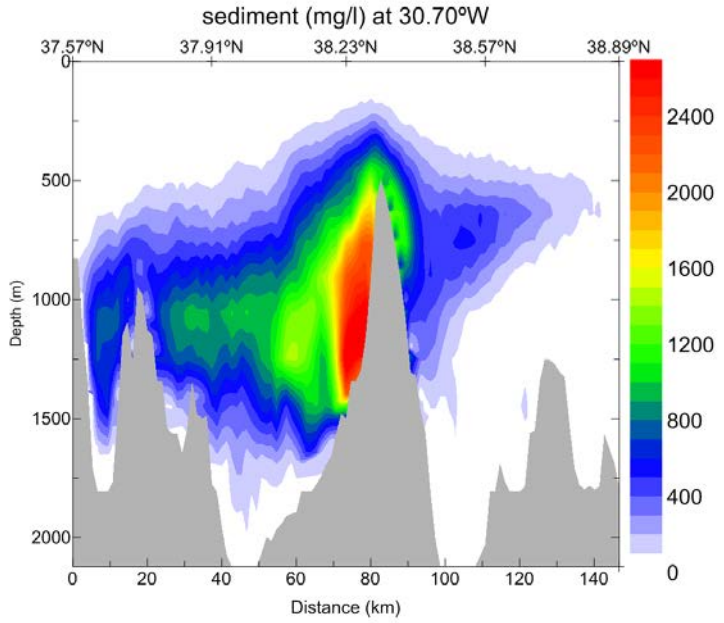
Spacing of mines along the ridge and their duration therefore has a major influence on the ability of ecosystems to recover from mining

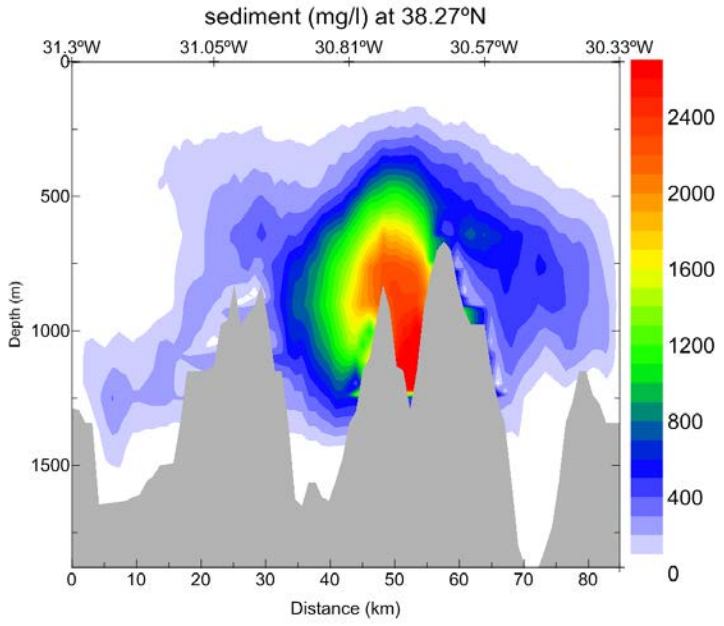
Potential impacts of plumes in the Azores

Average concentration generated at seafloor (mg·L^{-1})









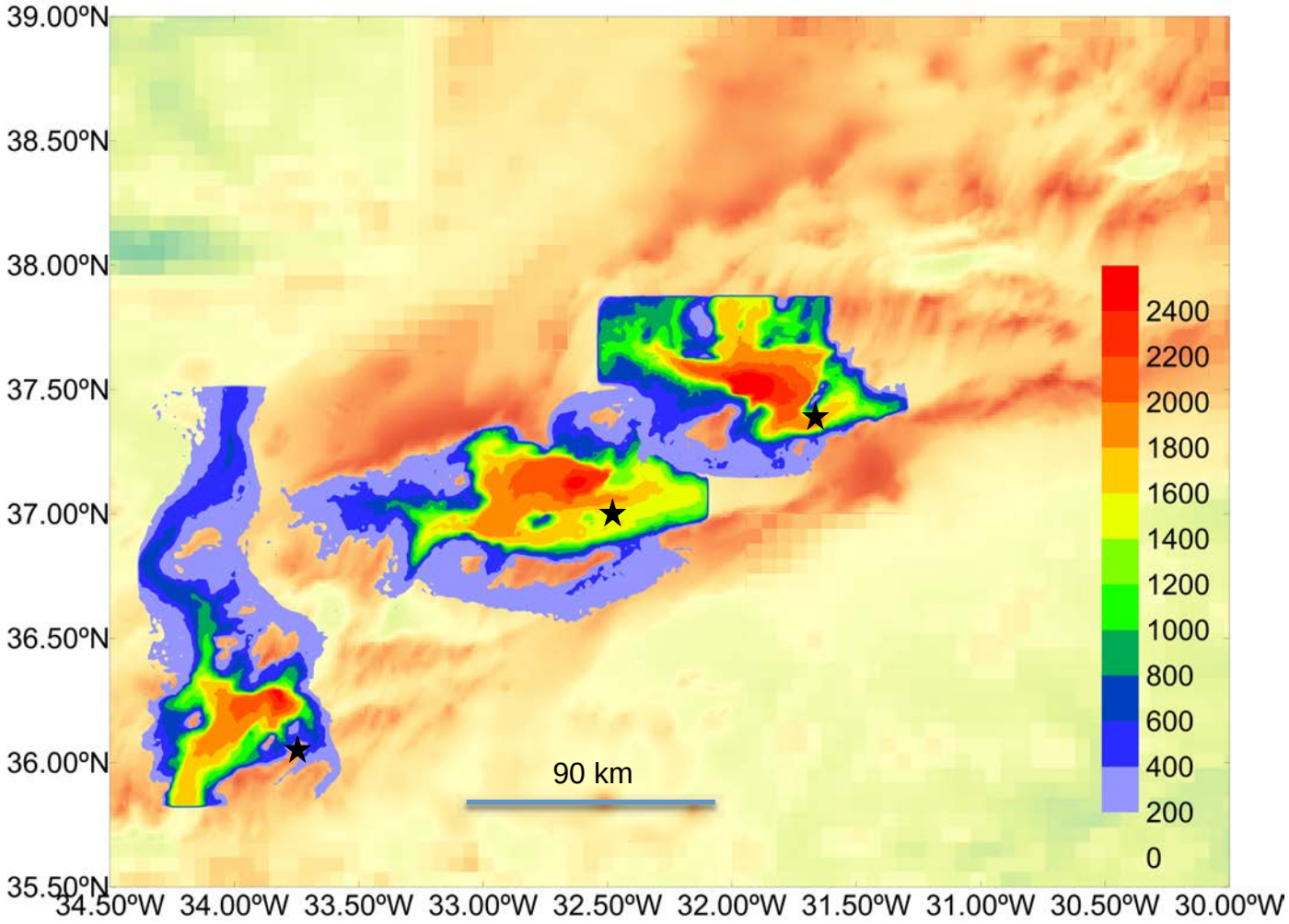
MIDAS
www.eu-midas.net

MANAGING IMPACTS OF DEEP SEA RESOURCE EXPLOITATION

Slide courtesy T. Morato U Azores

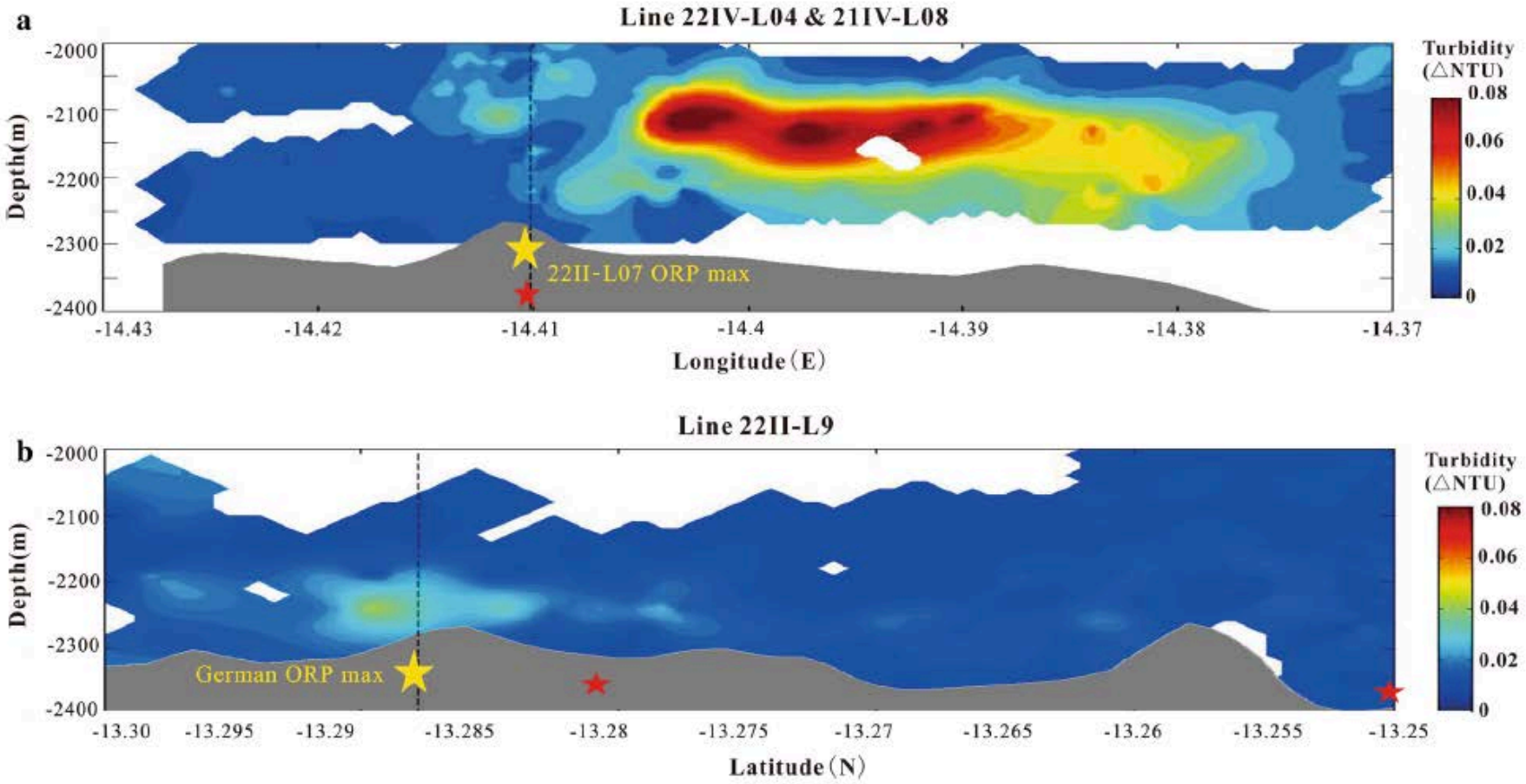
Potential impacts of plumes in the Azores

Average concentration generated at seafloor (mg·L^{-1})



Slide courtesy T. Morato U Azores

Hydrothermal plume - Zouyu-1 and Zouyu-2 hydrothermal fields in the southern Mid-Atlantic Ridge



1 km

From Tao et al., 2017 Mar Geophys Res

Key steps in developing the REMP

1. Identify areas of conservation value that could be vulnerable to the effects of exploitation

2. Identify the main environmental issues that need to be taken into account in planning the approval of mine sites – spatial and temporal considerations may apply

3. Assess possible mining scenarios and how these could have a negative environmental impact – especially cumulative impacts (consider other activities as necessary)

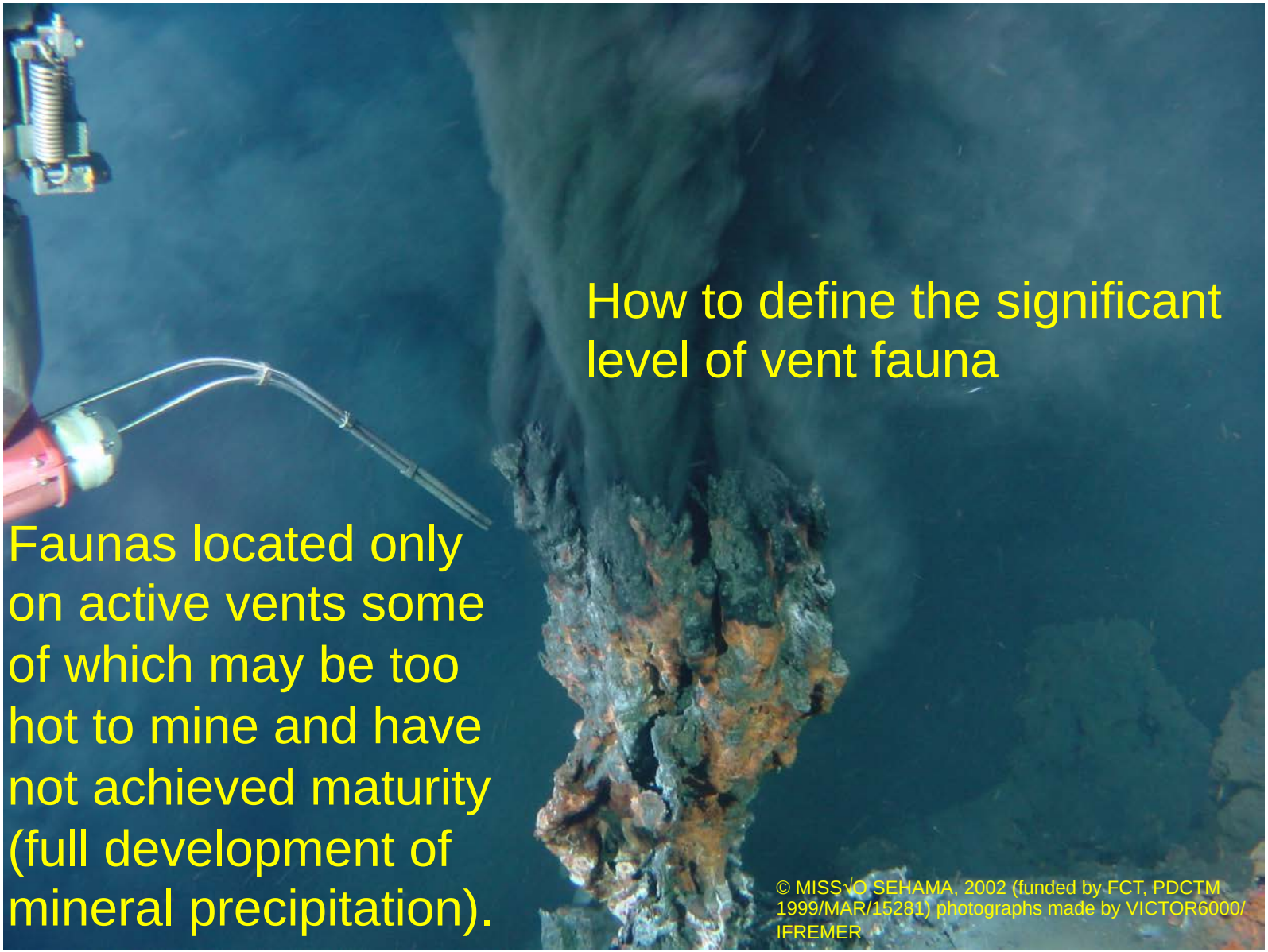
4. Devise a draft plan, that can be rules-based, area-based, or both that minimises environmental impact whilst maximising exploitation potential

5. Stakeholder engagement

Identification of areas of Conservation importance 1

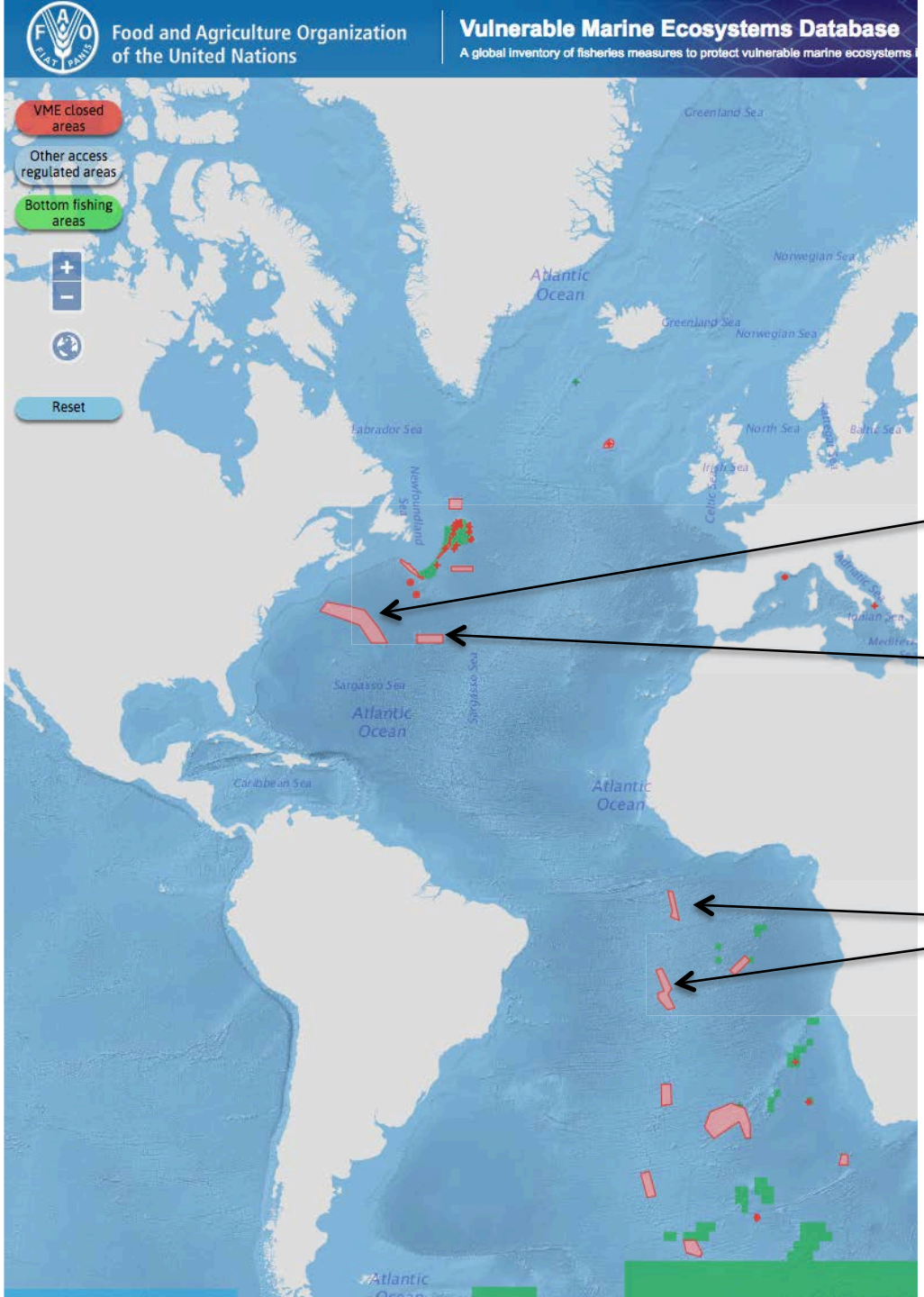
Hydrothermal vent faunas

Hydrothermal vents and protection of vent faunas



Identification of areas of Conservation importance 2

off axis non-vent faunas



Existing areas with conservation measures in the Atlantic (FAO database)

Coral and other hard bottom VME indicators

Pristine coral areas

Unexploited seamounts

Identify Areas of conservation importance 2

Major transform faults

The Vema Transform Fault, a major water-mass transport pathway between the deep western and eastern Atlantic Basins and an area with presumed cold seep habitats as suggested by the record of the indicator species *Abyssogena southwardae* (Krylova et al. 2010).

The Romanche Transform Fault, which includes a hadal biogeographic unit (Watling et al. 2013. The Romanche is a major transport pathway between the western and eastern Atlantic basins for dense water masses originating in polar regions (*35*, *36*, *45*). The proposed Romanche Transform Fault (RTF) subunit also overlaps substantively with the EBSA known as the “Atlantic Equatorial Fracture Zone and High Productivity System”.

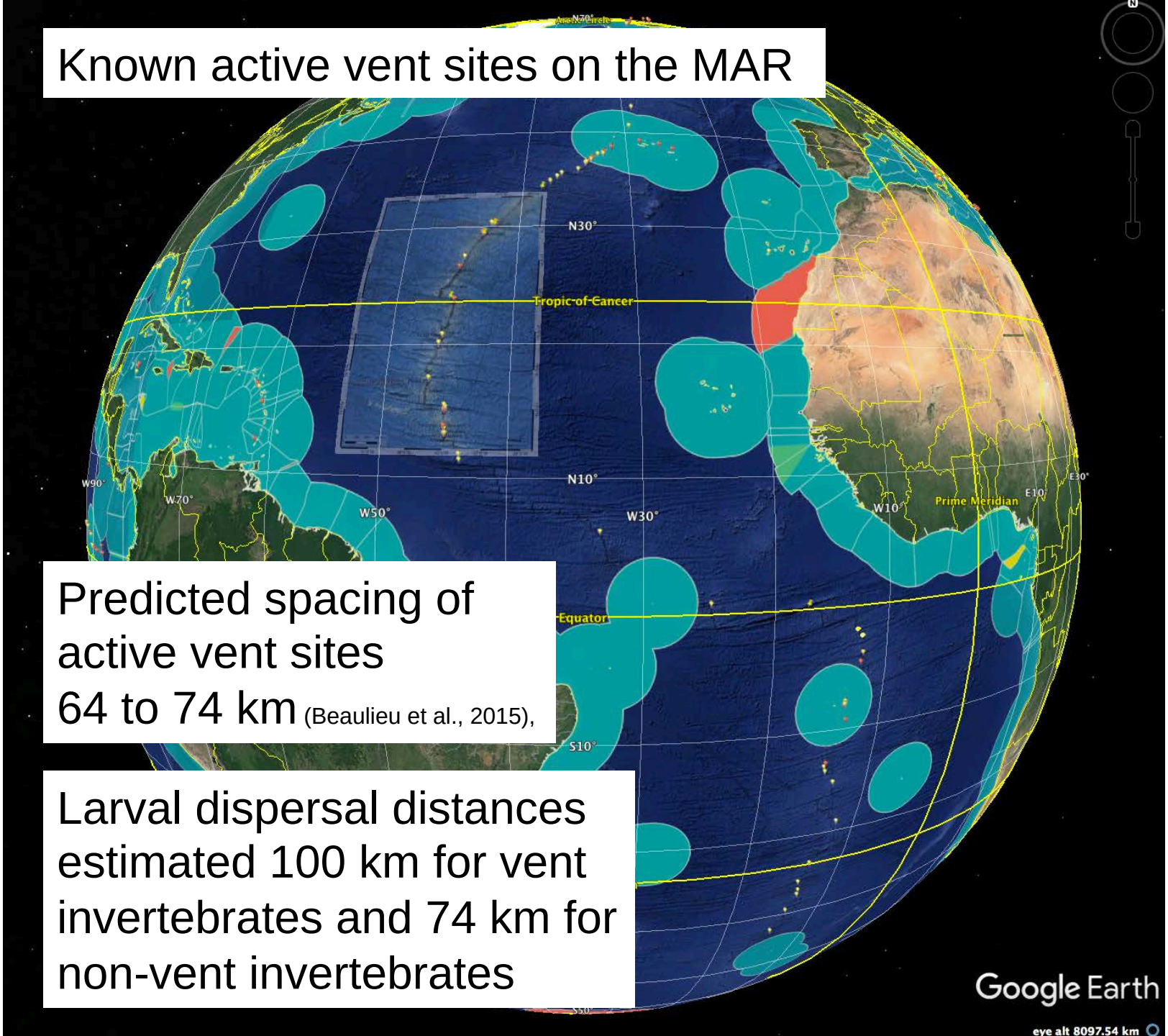
Biogeographic transition zones

The hybrid zone at Broken Spur; while multiple mussel hybrids are known along the MAR (the symbiont-bearing mussels *Bathymodiolus azoricus* and *B. puteoserpensis*), Broken Spur has the greatest proportion of hybrid individuals in a stabilized population with indications of local adaptation; this region also corresponds to a biogeographic sub-boundary between northern ‘bathyal’ and southern ‘abyssal’ vent faunas

The bathyal biogeographic transition zone between the North Atlantic and South Atlantic units (Watling et al. 2013).

Use of rules-based criteria in the REMP

- Essentially conserves the whole ridge and its flanks whilst allowing mining in a controlled way
- Allows an individual contractor to develop a mine plan such that mining and conservation can be accommodated in their contract area
- Addresses the potential for cumulative effects on ecosystem integrity from an early stage
- Is analogous to other industries operating within and near internationally protected areas, such as marine sand and gravel extraction and offshore wind

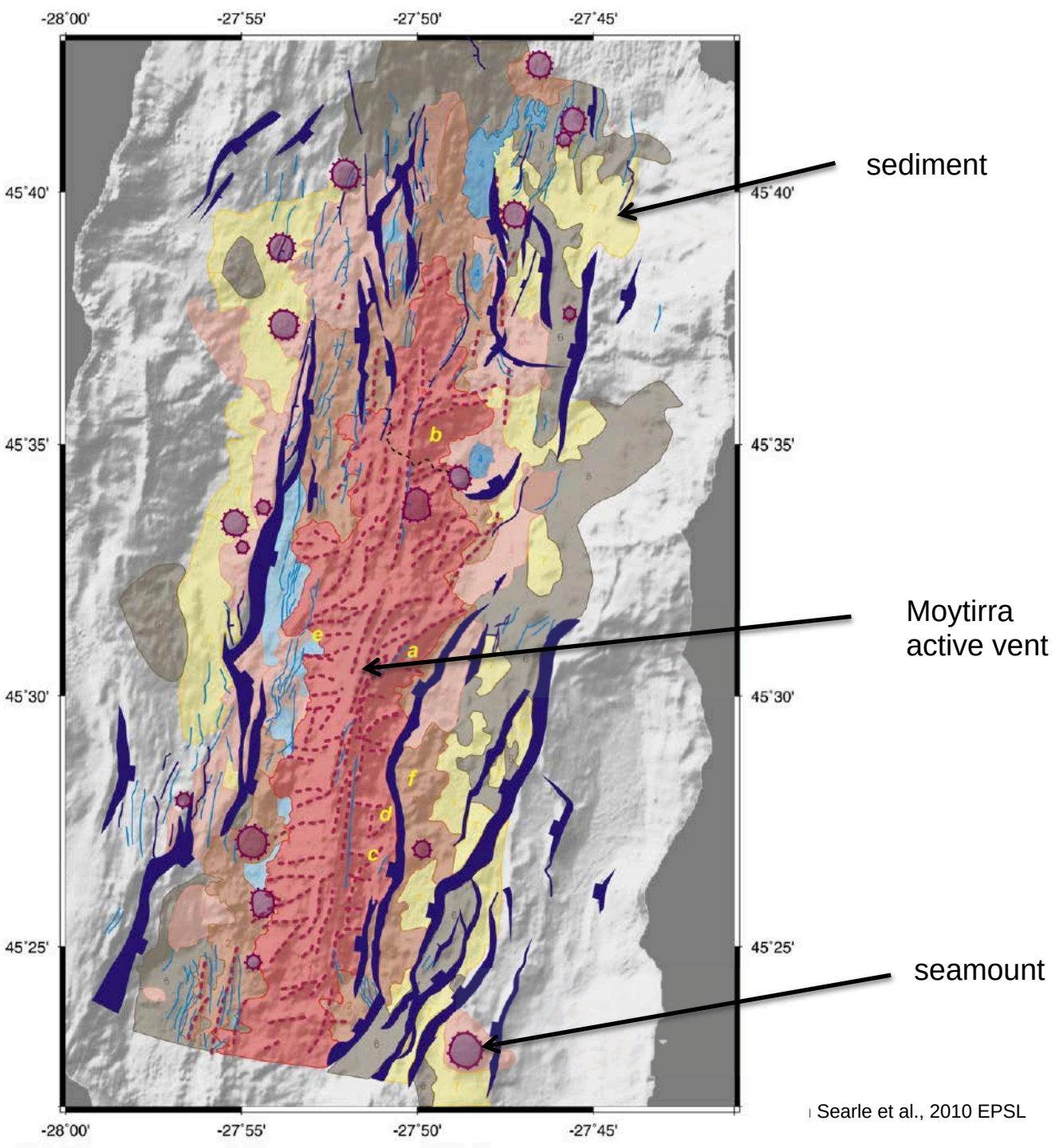

Known active vent sites on the MAR
Predicted spacing of active vent sites
64 to 74 km (Beaulieu et al., 2015),
Larval dispersal distances estimated 100 km for vent invertebrates and 74 km for non-vent invertebrates
N30°
Tropic of Cancer
N10°
Equator
S10°
W90°
W70°
W50°
W30°
W10°
Prime Meridian
E10°
E30°
Google Earth
eye alt 8097.54 km

Possible steps in generating a rules-based REMP

- Determine the secondary footprint of mine impact including both operational and discharge plumes
- Compare the predicted mining plumes with the impact of natural hydrothermal vent plumes if appropriate
- Identify vents with significant vent fauna in the contract area
- Identify non-vent areas of conservation significance in the vicinity of the planned mine site (including areas and depths where plumes and potential toxicity will have an impact)
- Set rules about how to define vent communities that need full protection and whether mining could be allowed on vents that don’t have well developed communities e.g. 50% to remain, if spaced no further apart than 100km
- Set rules about conserving non-vent areas of conservation significance e.g. an appropriately sized area to be identified and conserved within a distance of xx km from the mine site

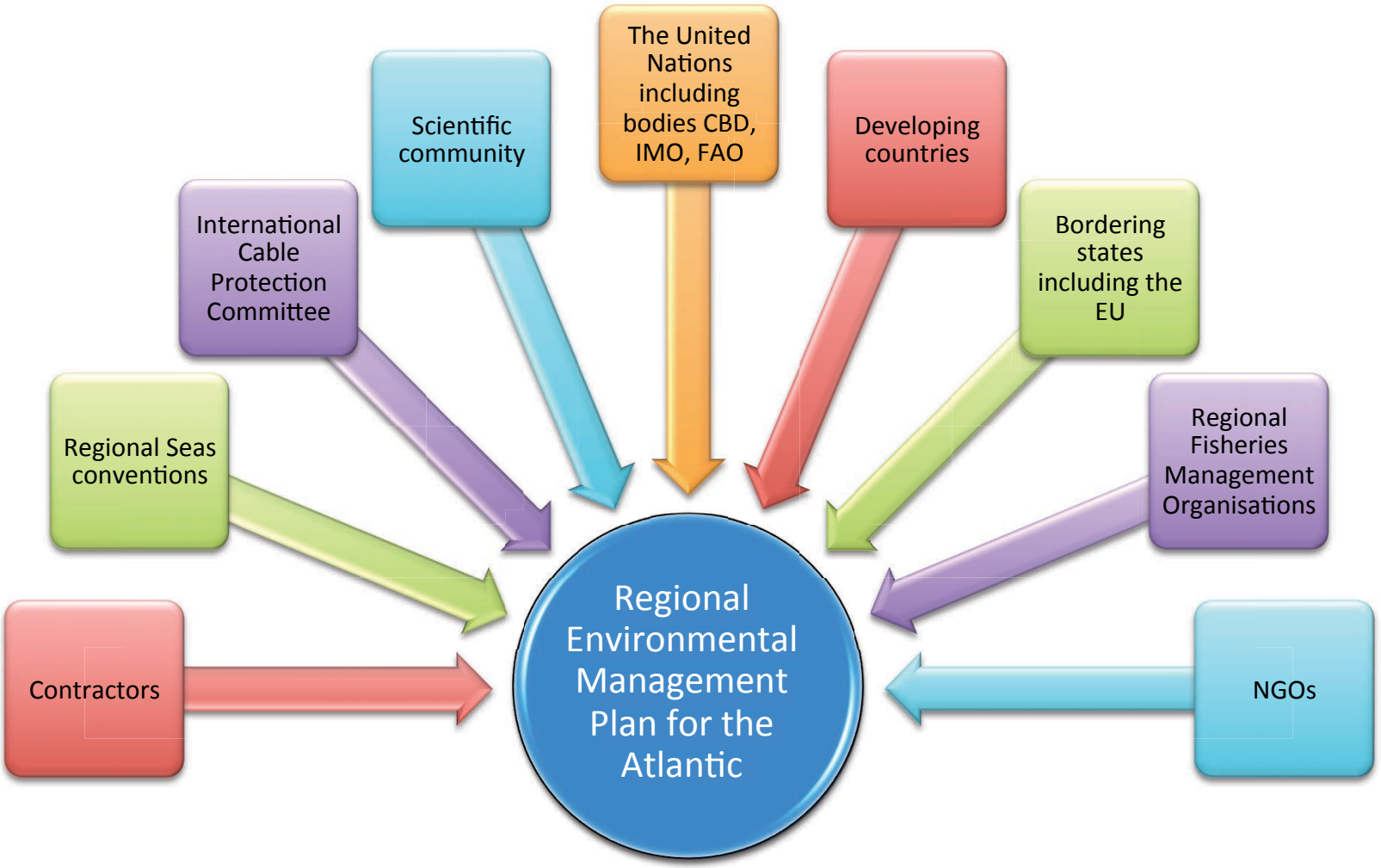
In future how far from the ridge axis will we be able to locate and mine SMS ores?

20m sediment thickness in ~1 million years = about 20-30 km from ridge axis

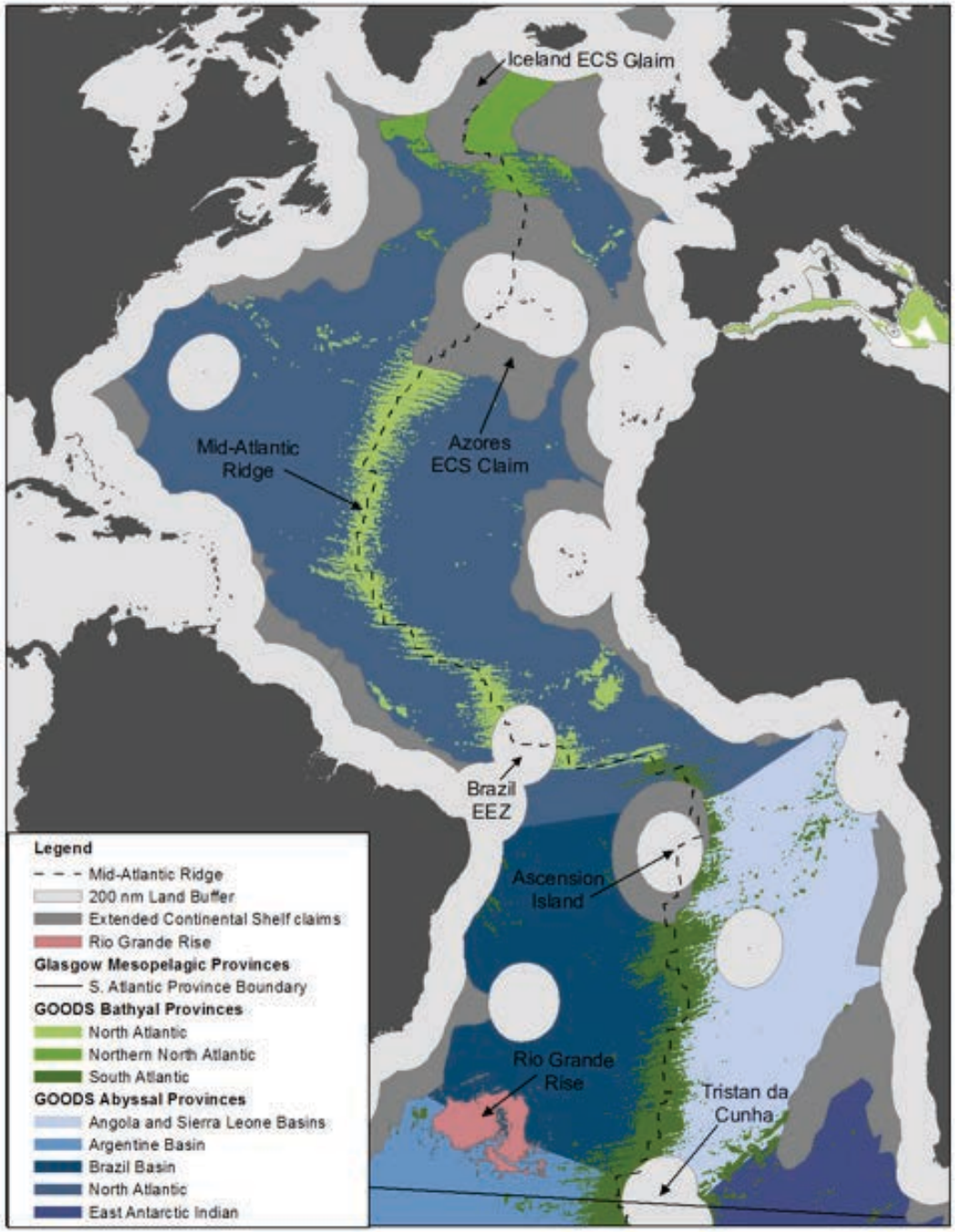


Searle et al., 2010 EPSL

Stakeholder engagement – who and how?



seascape consultants ltd



EASME proposal for developing a regional management plan for the Atlantic Ocean

- Work on behalf of the ISA
- Engage with stakeholders
- 3 – year duration – submit draft for consideration by Council and its LTC

seascape consultants ltd

Credit: IFE, URI-IAO, UW, Lost City Science Party; NOAA/ OAR/OER; The Lost City 2005 Expedition.