



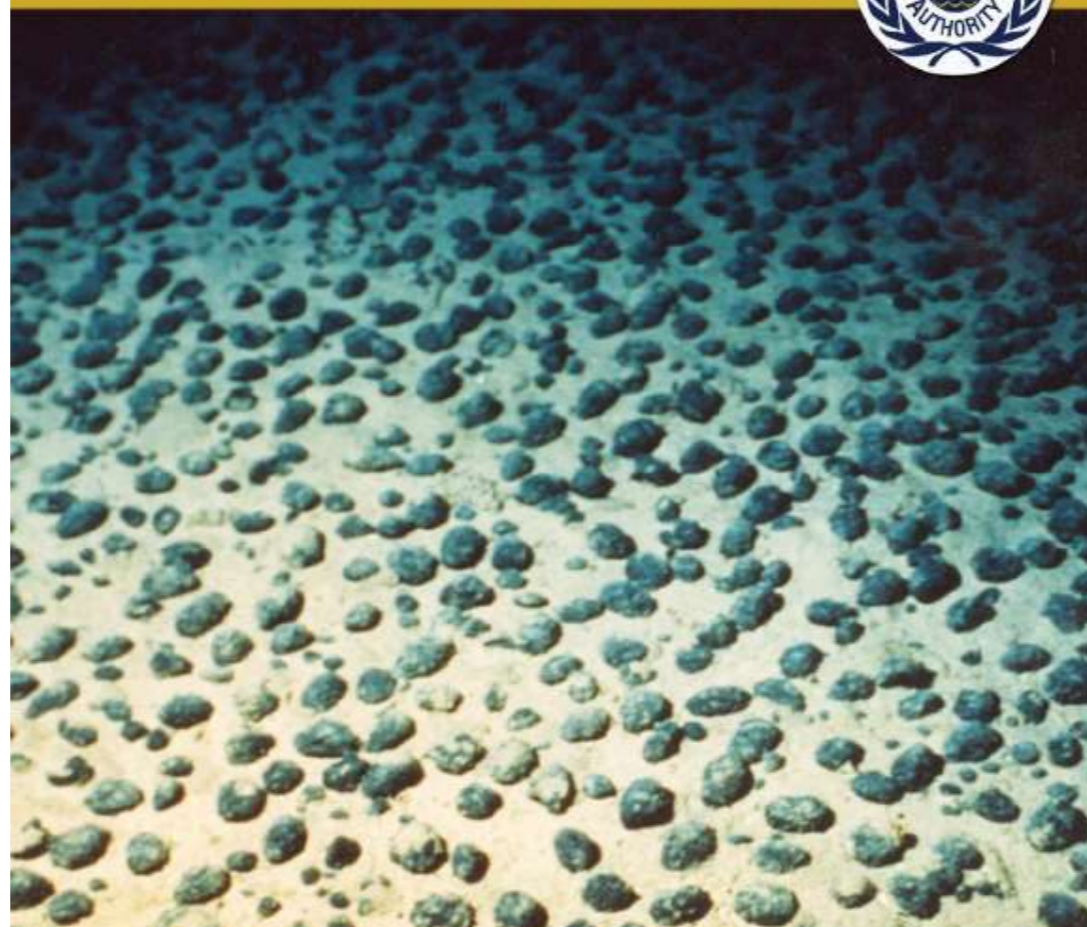
COMMITTEE FOR MINERAL RESERVES  
INTERNATIONAL REPORTING STANDARDS

# Marine Mining

Harry Parker  
CRIRSCO Annual meeting,  
Bogata, Colombia 20 November 2013

## Towards the Development of a Regulatory Framework for Polymetallic Nodule Exploitation in the Area

Technical Study: No. 11



- Increase in demand for metal
- Rise in metal prices
- Mining companies highly profitable
- Decline in tonnage and grade of land based Cu, Ni, Co sulphide deposits
- Technological advances in seabed mining and processing

- Nautilus –deep sea polymetallic sulphides near Papua New Guinea
- 17 active seabed exploration contracts in 2012
  - Government projects by Nauru, Tonga, China, Russia, UK, Kiribati, Belgium, Korea, France. Many of these are government-sponsored companies.
  - Mostly concentrating on nodules

- Small high-grade with rapid payback (high-risk of pioneering ventures)
- Larger high-grade
- Low grade
- Require comprehensive resource and reserve assessment
- Maximize reserve recovery, utilization and metals recovery

- Exploration
- File for provisional mining licence with prefeas study
- Feasibility study based on pilot mining, would result in a tenured licence
- EIA required
- Monitoring by ISA
- Detailed plans, ISA to approve each step



# Scope of work of Seabed Authority Study

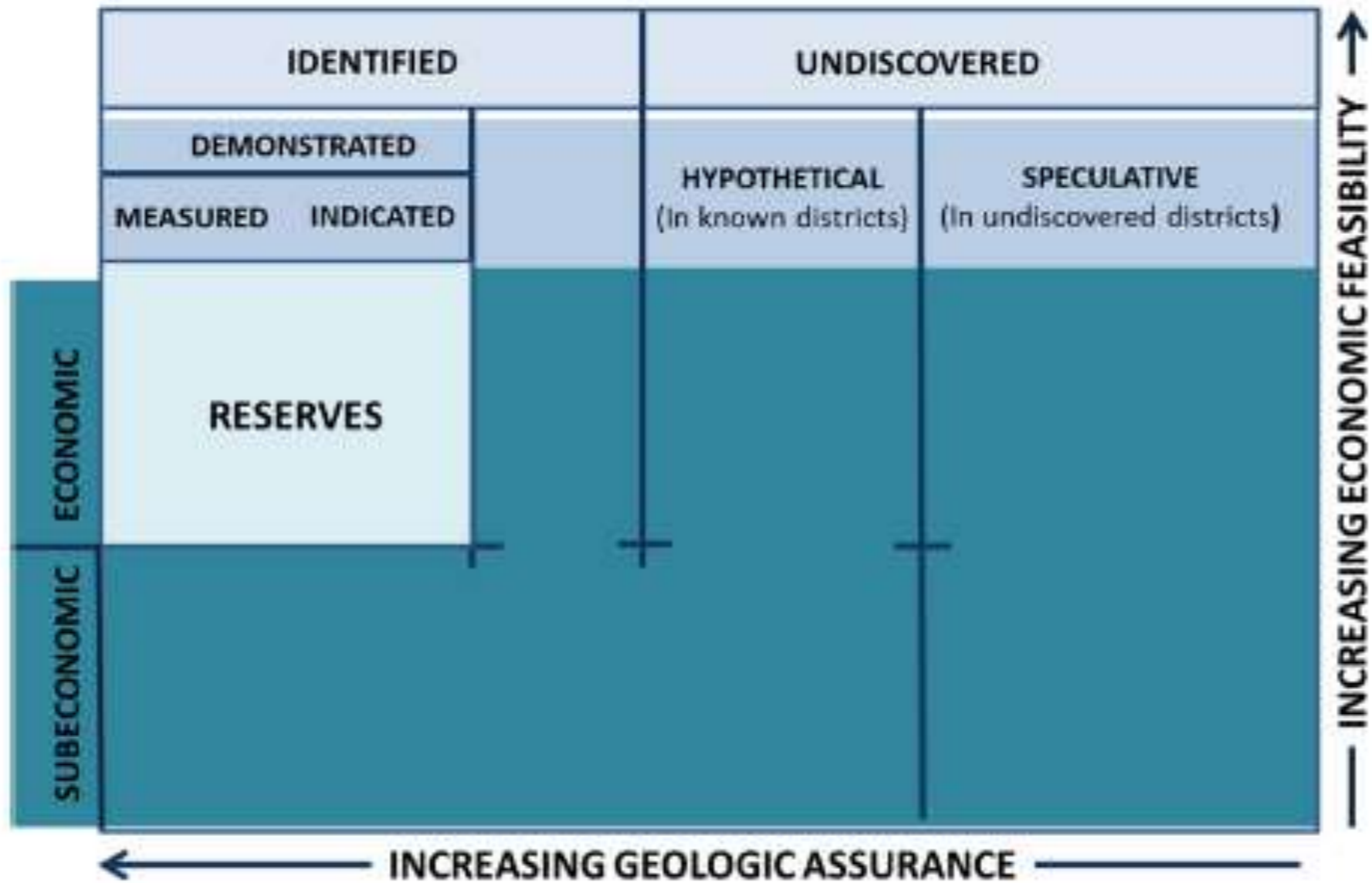
- Review Law of the Sea
- Review land based regulatory regime
- Economic issues, taxation royalties
- Define framework for Feasibility Study

- Development of resources in accordance with sound commercial principles. There shall be no subsidization.



# Currently all subeconomic resources

Figure 1: The Resource-Reserve Classification



(USGS/USBM, 1980)

# Additional sampling and analysis..

- Leads to transfer to economic reserves
- Adequate reserves must be demonstrated to start a mine.

- Very limited areas explored in detail
- Large areas with limited exploration
- Vast majority of area unexplored

- Clarion Claperton zone (5 million km<sup>2</sup>)
- 27 Gt of manganese nodules
- 7 Gt of contained Mn, 290 Mt contained Cu, 78 Mt of contained Co
- Typical grades: 1.4% Ni, 1.2 % Cu, 0.6% Co
- Trace metals, REE credits and penalties
- 80% undiscovered or hypothetical

- Requires 14 kg/m<sup>2</sup> (nodules?)
- Only 10-15% of Licence would have reserves
- Tonnage nor grades distributed evenly locally
- Focus on high nodule density and grade

- Whole of deposit mine plan (may not be possible to revisit a high-graded area)
- Comprehensive resource – reserve assessment
- Validation of Measured + Indicated
- Evaluation of Inferred Resources
- Sequential mining plan; maximize utilization
- Metal recovery
- Review of mine plan, emphasis on recovery optimization
- Performance metrics, penalties for failure to perform

- Mineral Resource and Ore Reserves follow CRIRSCO definitions
- Recognize variation in reserves, metal content and grades, processing recovery between sites; standards and guidelines project dependent
- Regulations required reporting specific to reserve utilization and metal recovery of mine plan



- See Caitlyn Antrim (next week)
- What is known about exploration, mining and processing methods?
- Consider whether enough known to warrant special sections in codes.
- Attend ISA conference

# Thank You



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