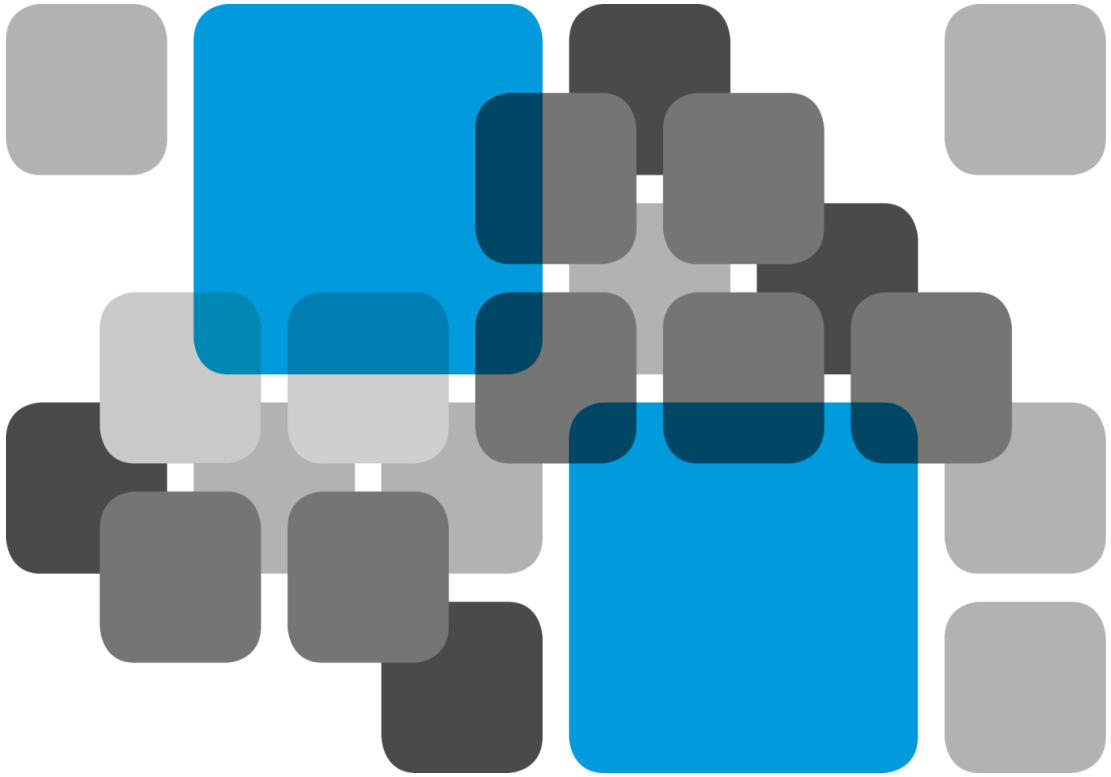
Recommending an appropriate valuation methodology for undersea polymetallic nodules

Prepared for International Seabed Authority

By CRU Consulting



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CRU Group - independent specialists in commodity market intelligence

CRU is a fully-independent company focused on Analysis, Consulting and Events in the commodity markets.

CRU was founded in base metals in the late 1960s and our 50 years of experience has established CRU as the authority in the commodity sector. We are uniquely positioned to draw upon our long-standing knowledge, experience and relationships in our market. CRU is able to offer a fully comprehensive multi-commodity service to our clients.

We are located in London, Mumbai, Beijing, Hong Kong, Sydney, Santiago, New York, and Pittsburgh. Our global footprint allows us to access crucial market information, and to build strong relationships with key market players around the world.

Employing a team of independent analysts, with over 200 experts in their field, CRU is the world's foremost consultancy to the global mining, metals and fertilizers sectors.

Analysis

- Subscriptions for regular publications and news
- Independent market analysis
- Short, medium and long-term market outlooks
- Cost analysis and forecasts

Consulting

- Advice tailored to the needs of our clients
- Strategy development
- Asset & project valuation
- Due diligence
- Policy advice & support

Events

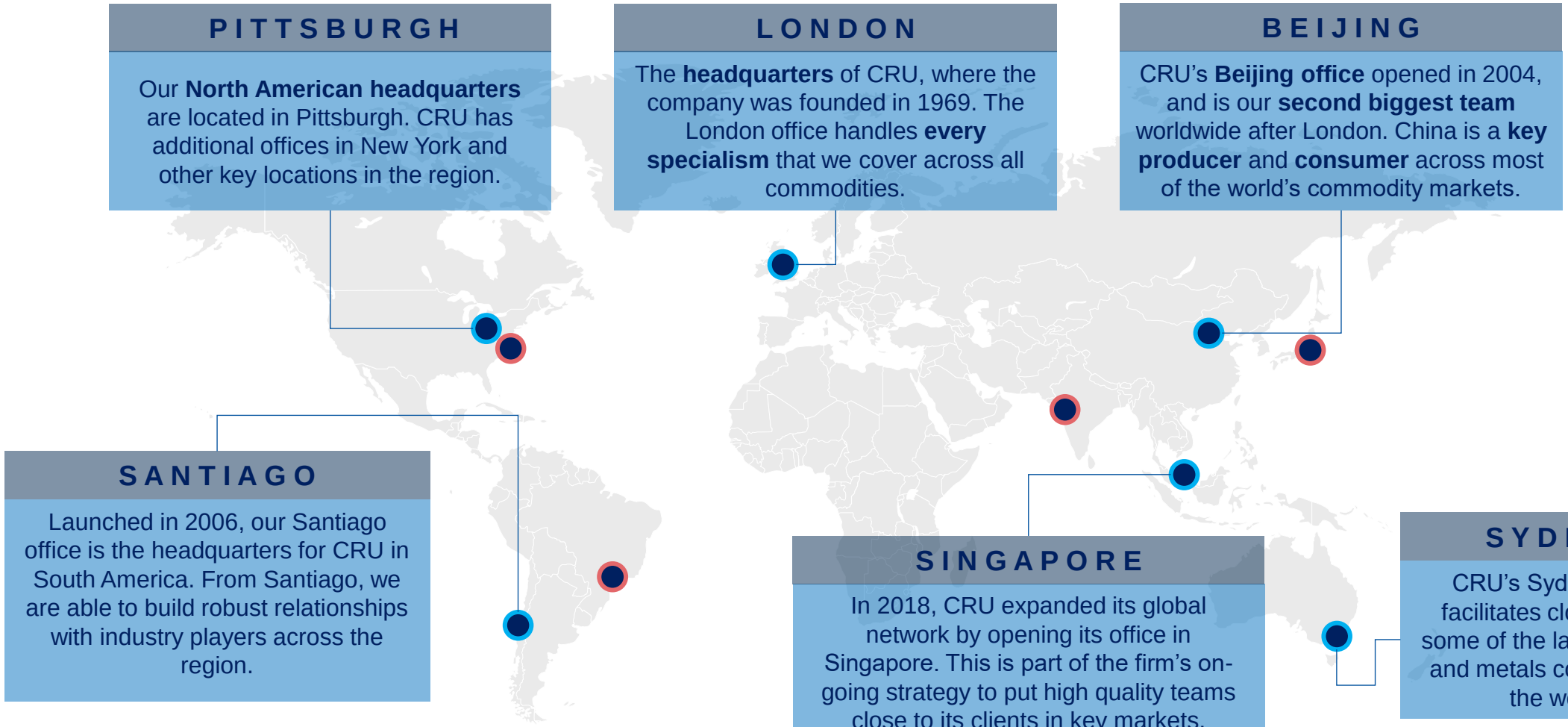
- Both commercial and technical events
- Conferences
- Seminars
- Workshops
- Networking forums

CRU specialises in mining, metal, and fertilizer commodities delivering business intelligence through analysis, consulting, and events

Date	Commodity
1969	**Copper**
1973	Lead & Zinc
1980	Steel
1981	**Nickel,** Chrome, Molybdenum
1982	Iron Ore
1982	Ferro-Alloys
1985	**Cobalt**
1986	Stainless Steel
1987	Metallurgical Coal
1988	Steel Sheets
1989	Ferro-Chrome
1990	Steel Long Products
1991	Steel Plate
1991	Wire & Cable
1992	**Manganese**
1997	Coke
2012	Alumina Price Index
2014	Thermal Coal
2016	Lithium

Key CRU Consulting knowledge centers

Analysis and Consulting offices Sales offices



PITTSBURGH

Our **North American headquarters** are located in Pittsburgh. CRU has additional offices in New York and other key locations in the region.

LONDON

The **headquarters** of CRU, where the company was founded in 1969. The London office handles **every specialism** that we cover across all commodities.

BEIJING

CRU's **Beijing office** opened in 2004, and is our **second biggest team** worldwide after London. China is a **key producer** and **consumer** across most of the world's commodity markets.

SANTIAGO

Launched in 2006, our Santiago office is the headquarters for CRU in South America. From Santiago, we are able to build robust relationships with industry players across the region.

SINGAPORE

In 2018, CRU expanded its global network by opening its office in Singapore. This is part of the firm's on-going strategy to put high quality teams close to its clients in key markets.

SYDNEY

CRU's Sydney office facilitates closer ties to some of the largest mining and metals companies in the world.

Background and objectives

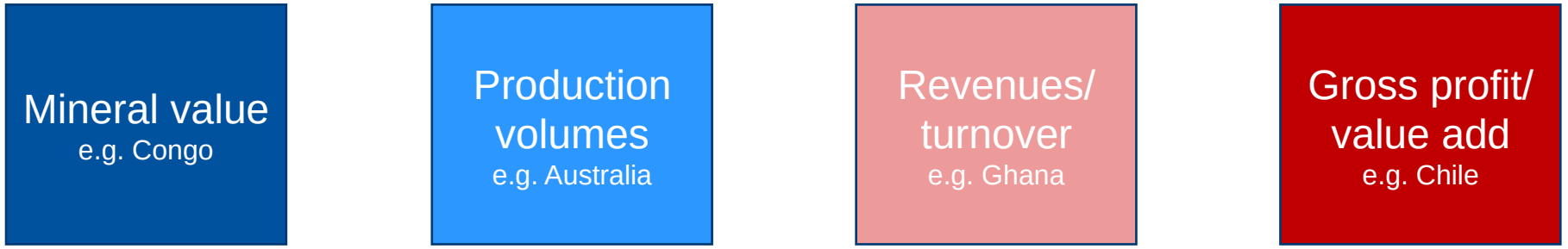
- Section 8 (1) (b) of the Annex to the 1994 Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea states that “the rates of payments under the system shall be within the range of those prevailing in respect of land-based mining of ***the same or similar minerals*** in order to avoid giving deep seabed miners an artificial competitive advantage or imposing on them a competitive disadvantage”;
- This is challenging to interpret given the lack of clear comparisons in terms of both the technical and extraction processes, and the associated economic values (given the lack of directly comparable products). Designing a fair and broadly comparable fiscal regime therefore requires an in-depth understanding of:
  - the relevant mineral value chains (and relevant land based alternatives)
  - the likely economic value of intermediate products considering relevant market comparators and specific seabed related extraction and processing co

Objective:
To advise on the **most appropriate valuation methodology for undersea polymetallic nodules** for the imposition of royalties

Mining royalty bases differ widely, raising comparability issues…

- The *fiscal regimes for minerals vary across industries and operators*. Royalty regimes feature widely in many countries, but their rates and basis differ widely. This raises issues concerning their comparability.

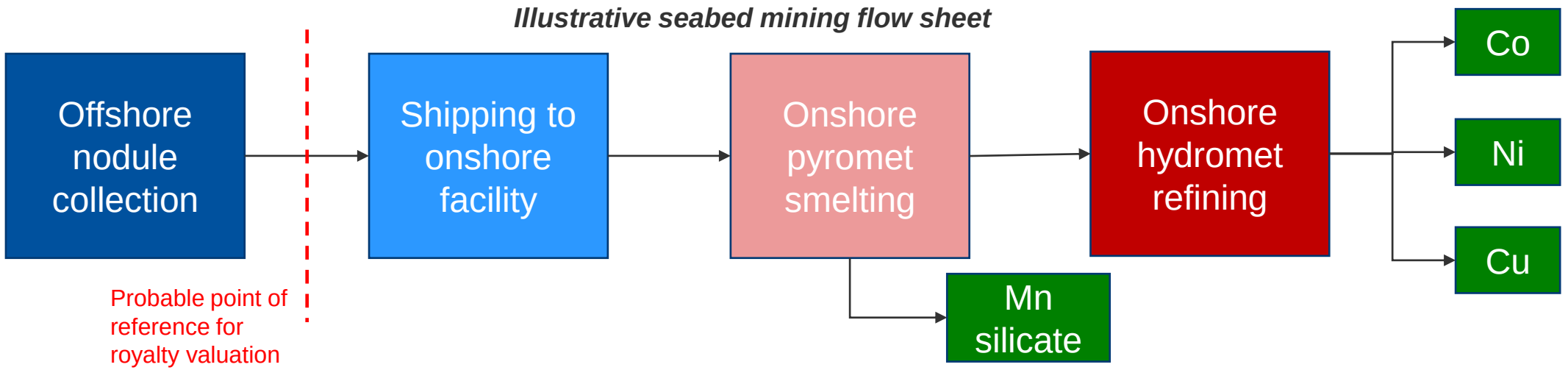
Common choices of royalty tax base in the mining industry



- Understanding the *effective burden* (royalty payments as a share of total revenues) is one approach to comparing the tax burdens across fiscal regimes and industry value chains
- This requires methodologies for *calculating the value of taxable ores* to ensure that the "same or similar" implementation criterion is satisfied
- Importantly, *ore values significantly differ from the value of contained metals*. Differences in mineralogy, processing and marketing costs mean that contained metal can be a very poor guide of the willingness of a buyer to pay for a given ore

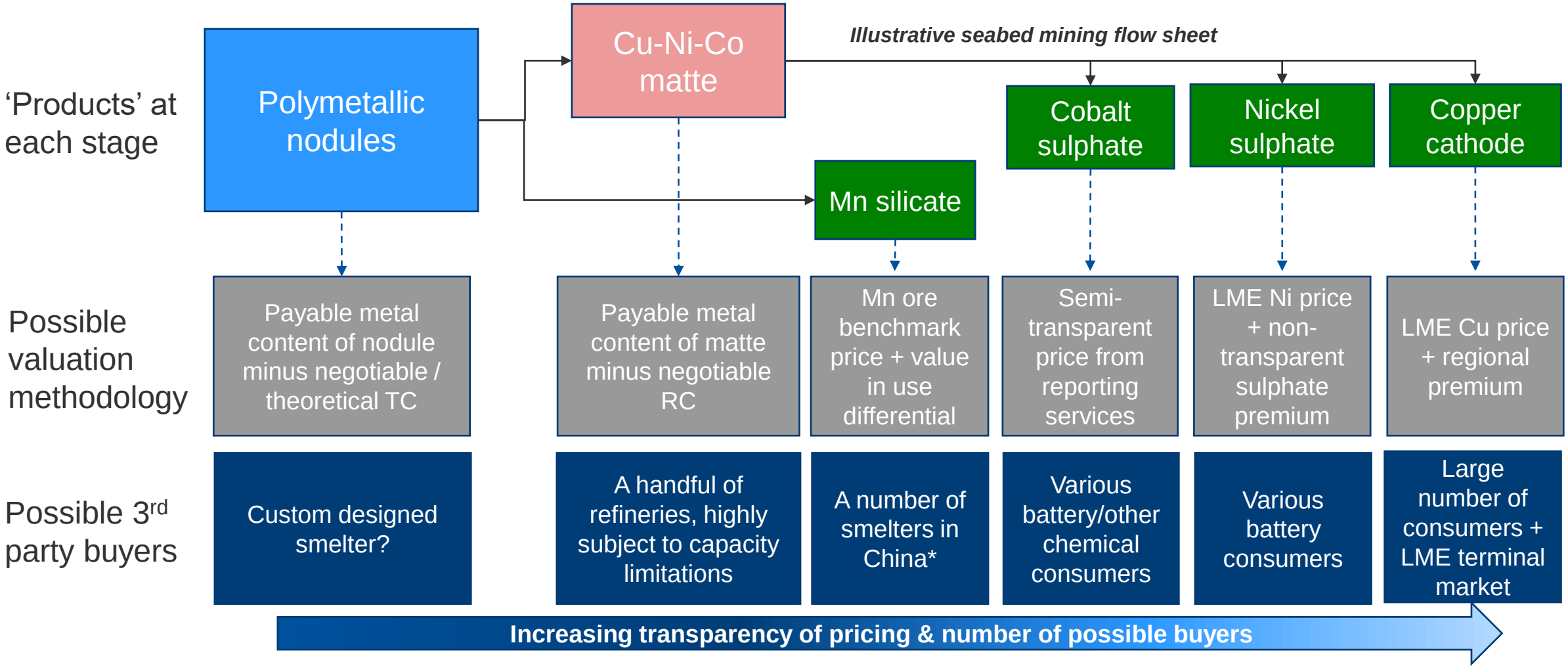
Processing costs mean ore values differ from the value of contained metal

Seabed value chains differ markedly from land based alternatives…



…seabed has greater polymetallic complexity & different points of tax compliance

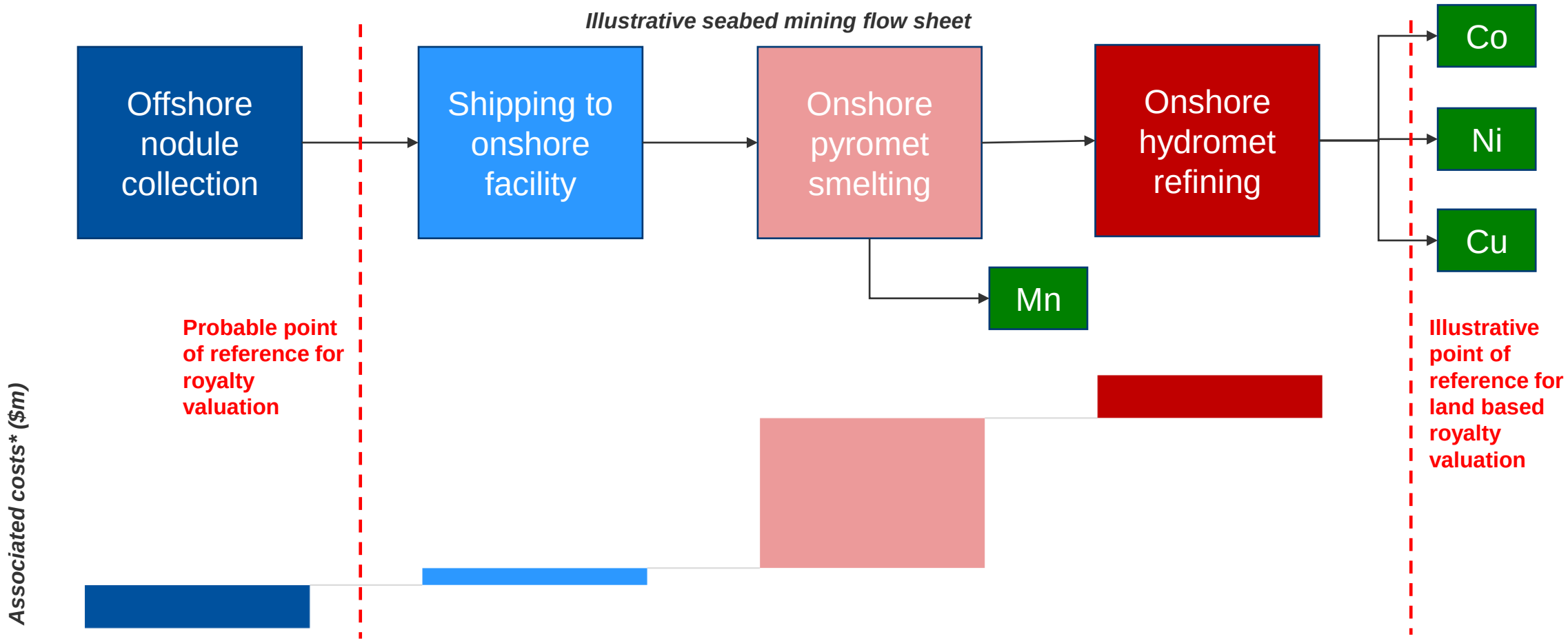
Transparency of materials pricing at each stage is highly variable



CRU specialise in data driven research in opaque natural resource markets

*Unique product, but relatively closely comparable to benchmark Mn ore – value is not market tested

Valuing contractors' product at the ISA's jurisdictional boundary…



…majority of costs incurred during onshore processing

Scope of work

1 A framework for comparability

This section will determine the basis for selecting comparators and the core methodologies for their evaluation

- Outline processing routes for seabed and relevant alternative land based mining value chains to better understand the industry context for comparator selection
- Establish criterion for identifying “same of similar” minerals based on appropriate metrics, including similarity in metal content, product mix, degree of processing/ value add, geographical proximity
- Identify relevant comparator regimes on “same of similar” minerals based on established criteria and analyse relative merits and demerits for their possible use as a benchmark

CRU have expertise in both seabed and land based mining value chains spanning all relevant raw materials markets including Mn, Co, Ni, and Cu

Scope of work

2 Describe appropriate valuation methodologies for fiscal base

Building on the comparator analysis outlined in section 1, CRU will describe methodologies for mineral valuation for the purpose of calculating royalties under a range of different example royalty regimes.

- CRU will describe typical royalty calculation methodologies across a range of mining regimes, focusing on the measurement of the value used for the fiscal base in each case (i.e. metal content, ore value, profit, etc)
- These methods will predominately describe royalties applied to Mn, Cu, Ni and Co.
- We will comment on the point in the value chain at which these methodologies apply the royalty, and relate this to the value chain in the case of the polymetallic nodules.

CRU have in deep expertise in metals and mining fiscal regimes which is embedded, for example, into our analysis of fundamental competitive positioning within and across the industry

Comparator regimes will focus on the list of relevant jurisdictions provided by the ISA as appropriate; specifically: Australia, Canada, Chile, China, DRC, France, Gabon, Indonesia, Peru, Philippines, Russia, South Africa and Brazil. However this will not include an exhaustive review of the complete royalty regimes in all of these jurisdictions.

Scope of work

3 Valuation methodology recommendations

Based on the analysis of the valuation methodologies described in section 2, we will provide recommendations as to which valuation methodology is the most appropriate in the case of the polymetallic nodules.

- CRU's recommendations, and the reasoning and assumptions behind them will be clearly explained, along with any risks or downsides to the recommended approach
- We will provide analysis of reasonable outputs for the recommended nodule valuation formulae through pricing cycles. Where appropriate we will provide specific formulae and worked examples

CRU has previously recommended appropriate fair value pricing formulae for mine operators and governing jurisdictions for taxation and arbitration purposes, including for niche metal intermediate products with non-transparent pricing – we are able provide a reasoned and well-researched independent view that can be practically applied and trusted as independent by all parties.

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