International standardisation for the reporting of Mineral Resources and Ore Reserves

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Agenda

- Introduction
- Reporting Resources and Reserves - Evolution.
- CRIRSCO Template as an International Standard
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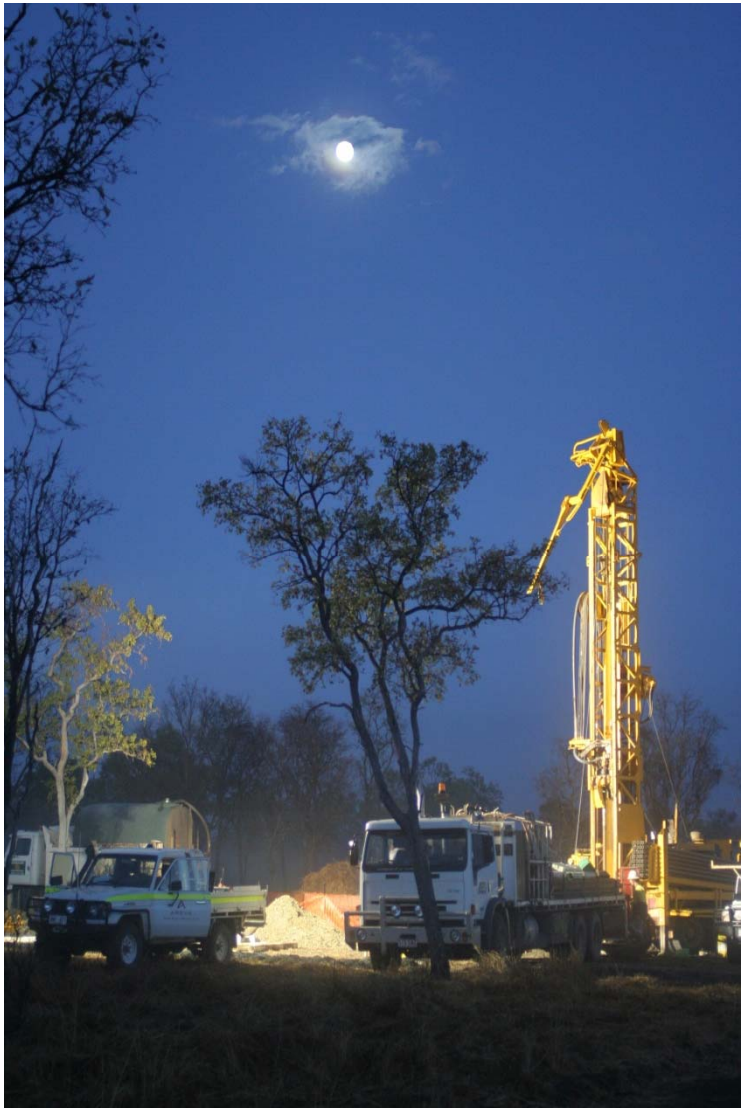
- Conclusion

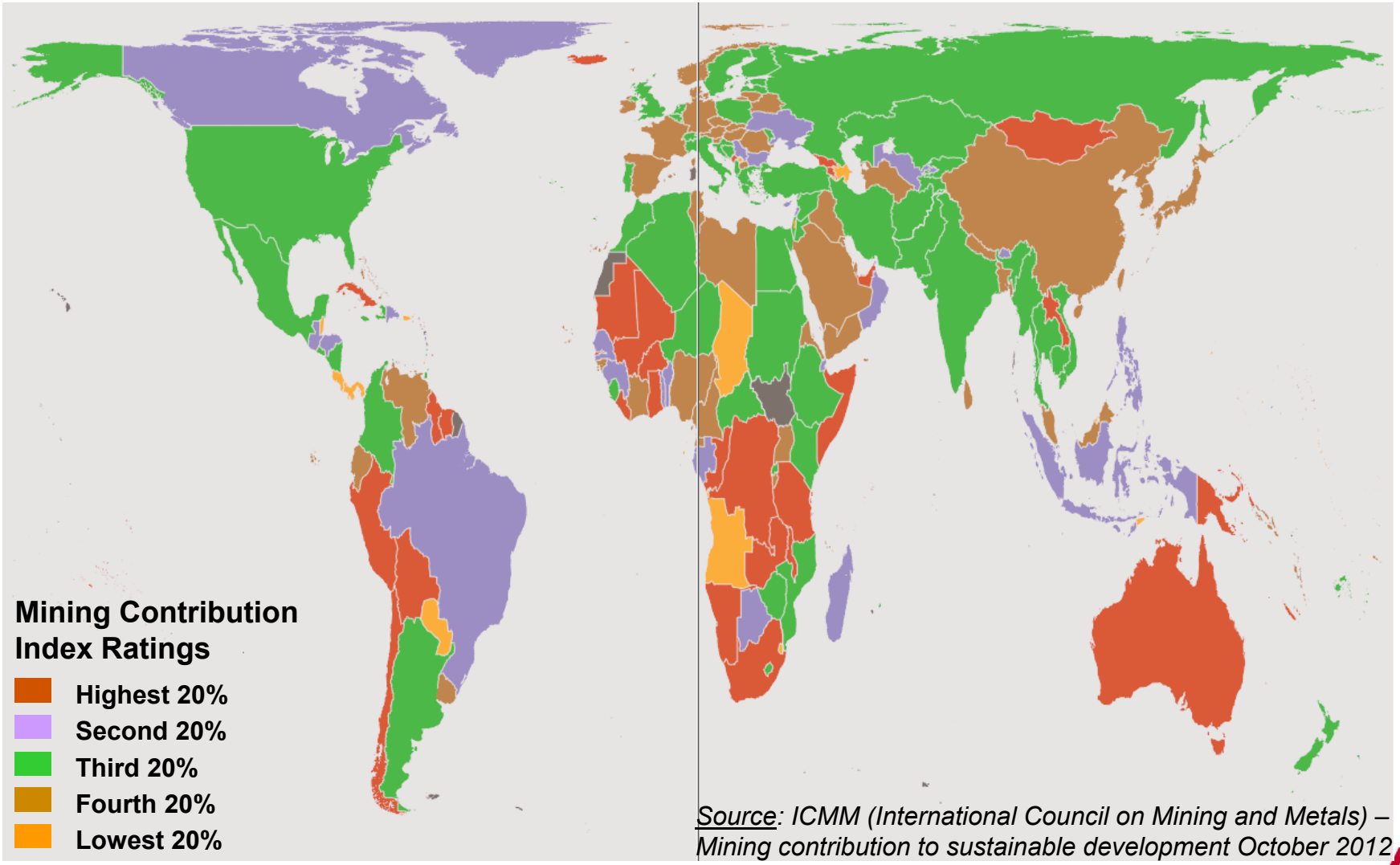


Introduction

- The mining industry is a vital contributor to national and global economies.
- It is a truly international business that depends on the trust and confidence of investors and other stakeholders for its financial and operational well-being.
- Unlike many other industries, it is based on depleting mineral assets, the knowledge of which is imperfect prior to the commencement of extraction.
- It is therefore essential that the industry communicates the risks associated with investment effectively and transparently in order to earn the level of trust necessary to underpin its activities.
- Enforceable mineral resource and mineral (Ore) reserves codes are critical to earning this confidence.

Source: CRIRSCO website 2014

Role of Mining in National Economies



Source: ICMM (International Council on Mining and Metals) – Mining contribution to sustainable development October 2012

Reporting Resources and Reserves – Evolution 1/2

- The mining and exploration industry is riddled with stories of entrepreneurial activity. Some of this has been positive for the industry and other negative.
- The need to put in context statements made concerning resources was recognised in early 1900's. Professional organisations published definitions for the use of certain terminology but there was no obligation to adhere to them. To some extent there was also a degree of latitude in the interpretation of the definition and its application.
- Over time reporting codes became more prescriptive. Concepts such as geological continuity and confidence in the accuracy of the estimates were introduced.

Reporting Resources and Reserves – Evolution 2/2

- 1950s – 70s. Terminology similar to that of today was introduced
  - Measured, indicated and inferred
  - Proved, probable and possible
  - Problem – terminology often taken as interchangeable (synonyms)
  - 1960's GKZ (Russian reporting standards) well developed and widely used;
- 1989 Australasian Institute of Mining and Metallurgy released the JORC code for public reporting of mineral resources and ore reserves. The 1989 publication differed from those preceding in two critical ways
  - **it was immediately incorporated into Australian Stock Exchange (ASX) listing rules, thereby becoming binding on companies listed on the ASX and**
  - it was also immediately adopted by The AusIMM as an Institute Code, and therefore became binding on members of The AusIMM.
- 1990's development of United Nations Framework classification (UNFC) by UNECE with funding under a global mandate from the UN Economic and Social Council
- 1994, the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) has worked to create a set of standard international definitions for reporting Mineral Resources and Mineral (Ore) Reserves, based on the evolving JORC Code's definitions.

Committee for Mineral Reserves International Reporting Standards

(CRIRSCO)

CRIRSCO - Evolution

- Formed 1994 under the Council of Mining and Metallurgical Institutes (CMMI) as an international initiative to standardise market related reporting definitions for mineral resources and reserves.
- CRIRSCO is not a code - it is a template for countries wanting to develop their own codes. It is advisory only and has no legal or regulatory force. It relies on its constituent members to ensure regulatory and disciplinary oversight at a national level.
- Since 2005 has been the basis for discussions with the International Accounting Standards Board (IASB) on standardising the approach of the extractive industries (oil, gas and solid minerals) to resource and reserve definition for financial accounting purposes.
- 2006 - first CRIRSCO template released.
- May 2013 - Updated Template includes definitions for scoping, pre-feasibility and feasibility studies.

CRIRSCO

- ***Application:*** to all solid minerals (metals, gemstones, industrial minerals, energy minerals such as coal and uranium)
- ***Aim:*** Promoting International best practice in the **public reporting** of Mineral exploration results, mineral resources and mineral reserves according to the levels of confidence in geological knowledge and technical and economic considerations.
  - International consensus on reporting standards
  - Encourages consistent and high quality reporting – through maintenance of competant person standards
- ***Objectives:*** reliable, transparent information for investors and potential investors
- ***Users include:*** Mining companies, financial institutions, stock exchanges, regulators, governments, shareholders .

Source: Henley. EU meeting Brussels 14 May 2013

CRIRSCO Family

- CRIRSCO family (NRO's – National reporting Organisations)
  - JORC (Australasia)
  - CIM (Canada)
  - IMEC (Chile*) - 2004
  - PERC (Europe)
  - NAEN (Russia*) - 2010
  - SAMCODES (South Africa)
  - SME (United States of America)

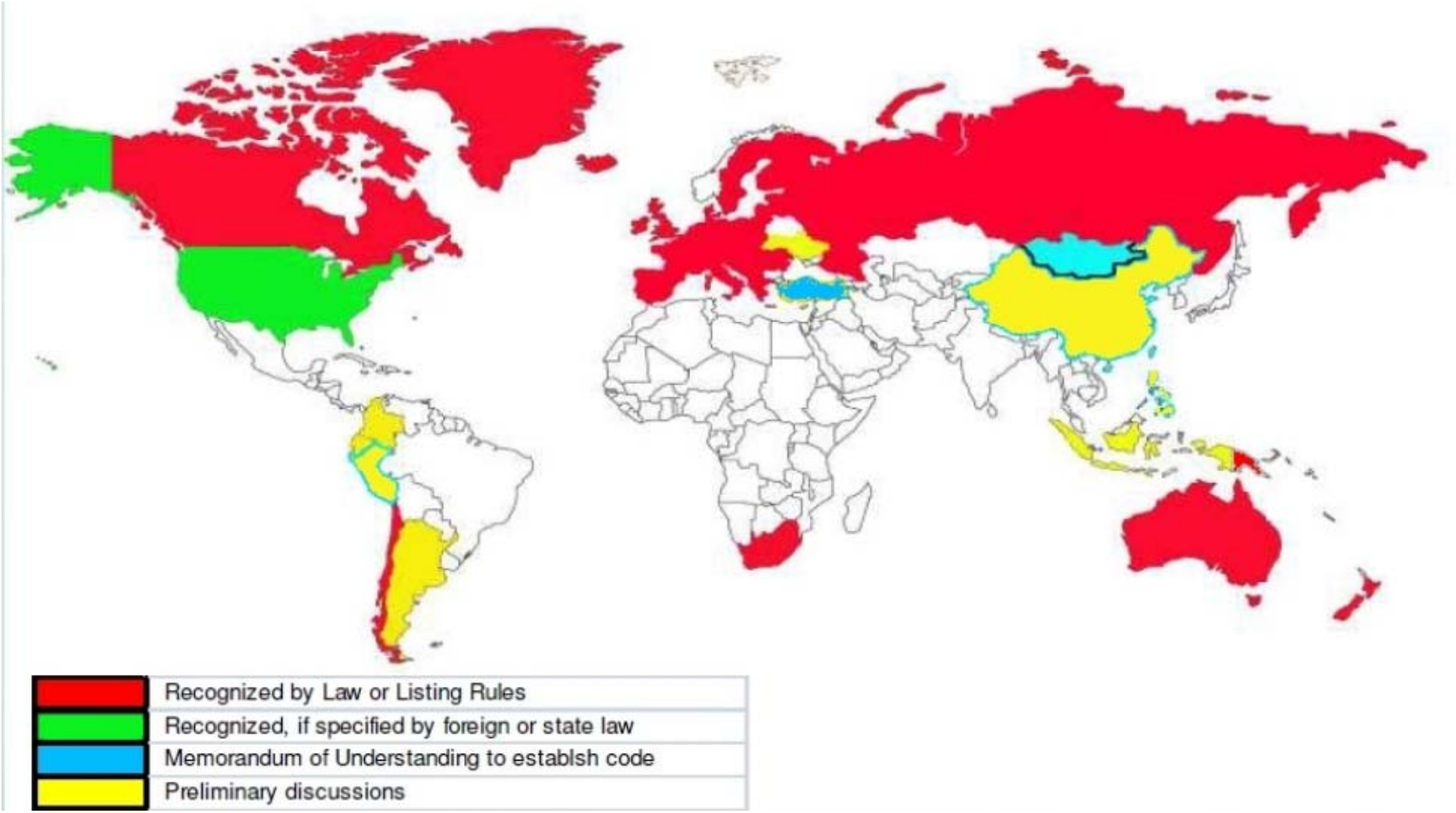
- 6 June 2013 – Memorandum of Understanding was signed by Authorities from Russia and **Kazakhstan** by for the accession of Kazakhstan to the international reporting standards for reserves and resources of the CRIRSCO family through the use of the Russian Code for Public Reporting of Exploration Results, Mineral Resource and Reserve (NAEN Code) and the Guidelines on Alignment of Russian minerals reporting standards and the CRIRSCO

CRIRSCO Family

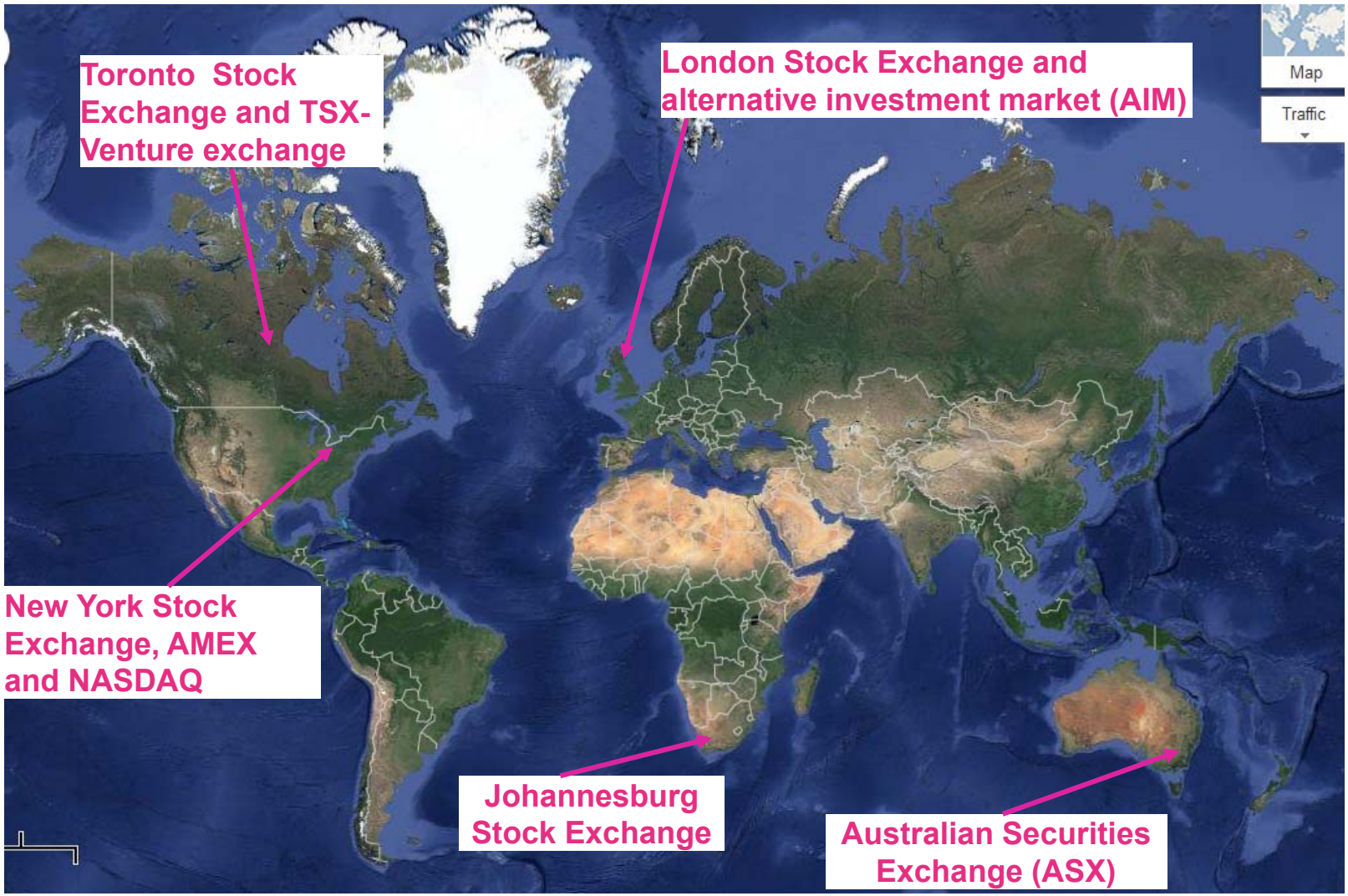
- Other potential members
  - Mongolia
  - Brazil
  - China
  - Sub Marine and Petroleum ongoing discussion and mapping of definitions

- Prior to Russia joining the CRIRSCO family the combined value of mining companies listed on the stock exchanges of member countries accounted for more than 80% of the listed capital of the mining industry.

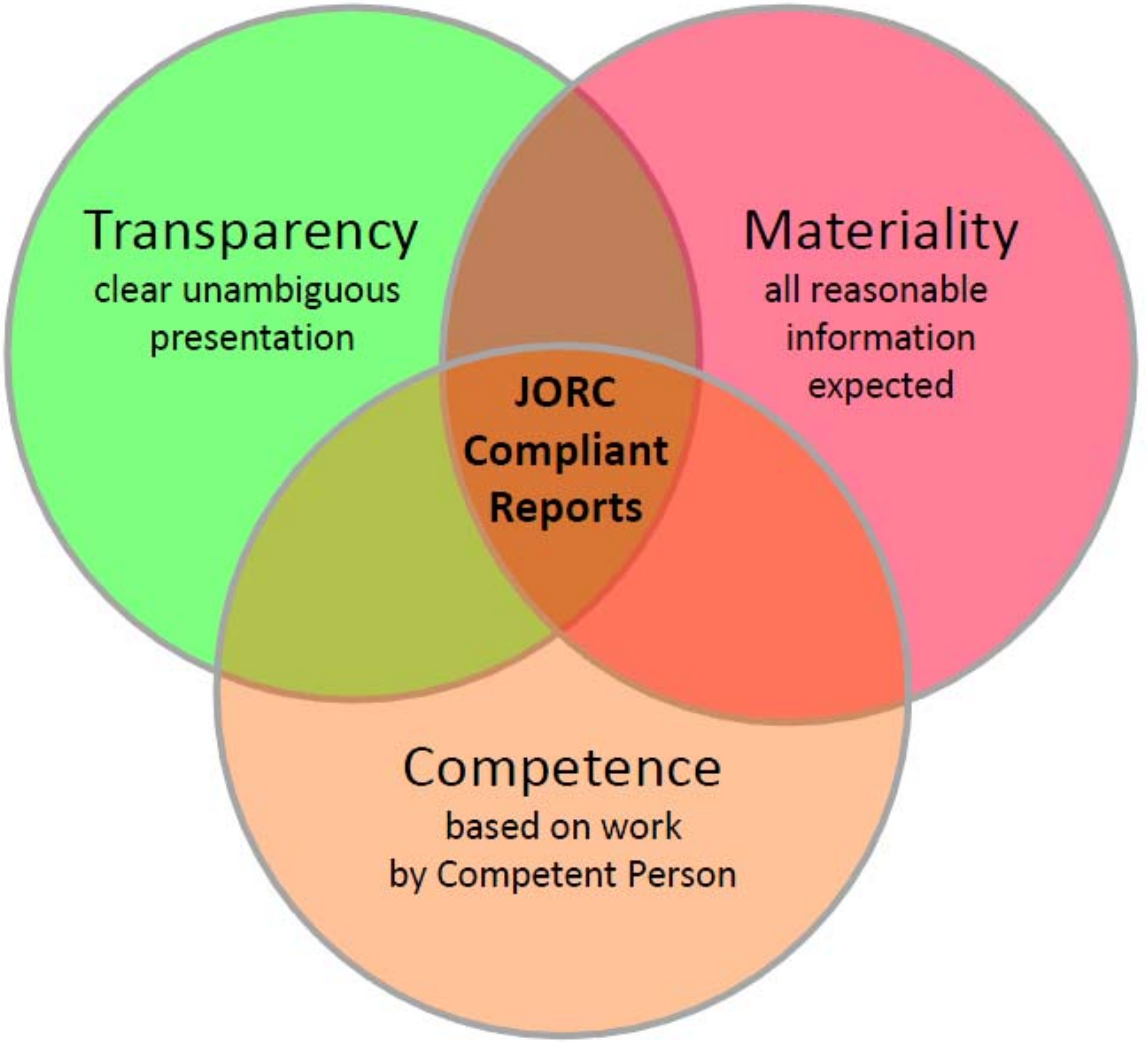
CRIRSCO – Family of Codes



Preferred Capital Markets for Mining Projects



CRIRSCO - Principles



Competent Person

- A Competent Person is a minerals industry professional National Reporting Organisation (NRO) to insert appropriate membership class and organisation including ***'Recognised Professional Organisation' (RPO))*** with enforceable disciplinary processes including the powers to suspend or expel a member.
- A Competent Person can be disciplined by their member organisation irrespective of the country in which their report is published.
- A Competent Person must have a minimum of five years relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking.

Competent Person synonymous terms Qualified Person (Canada) and Qualified Competent Person (Chile)
**potentially further qualification of this word in subsequent codes*

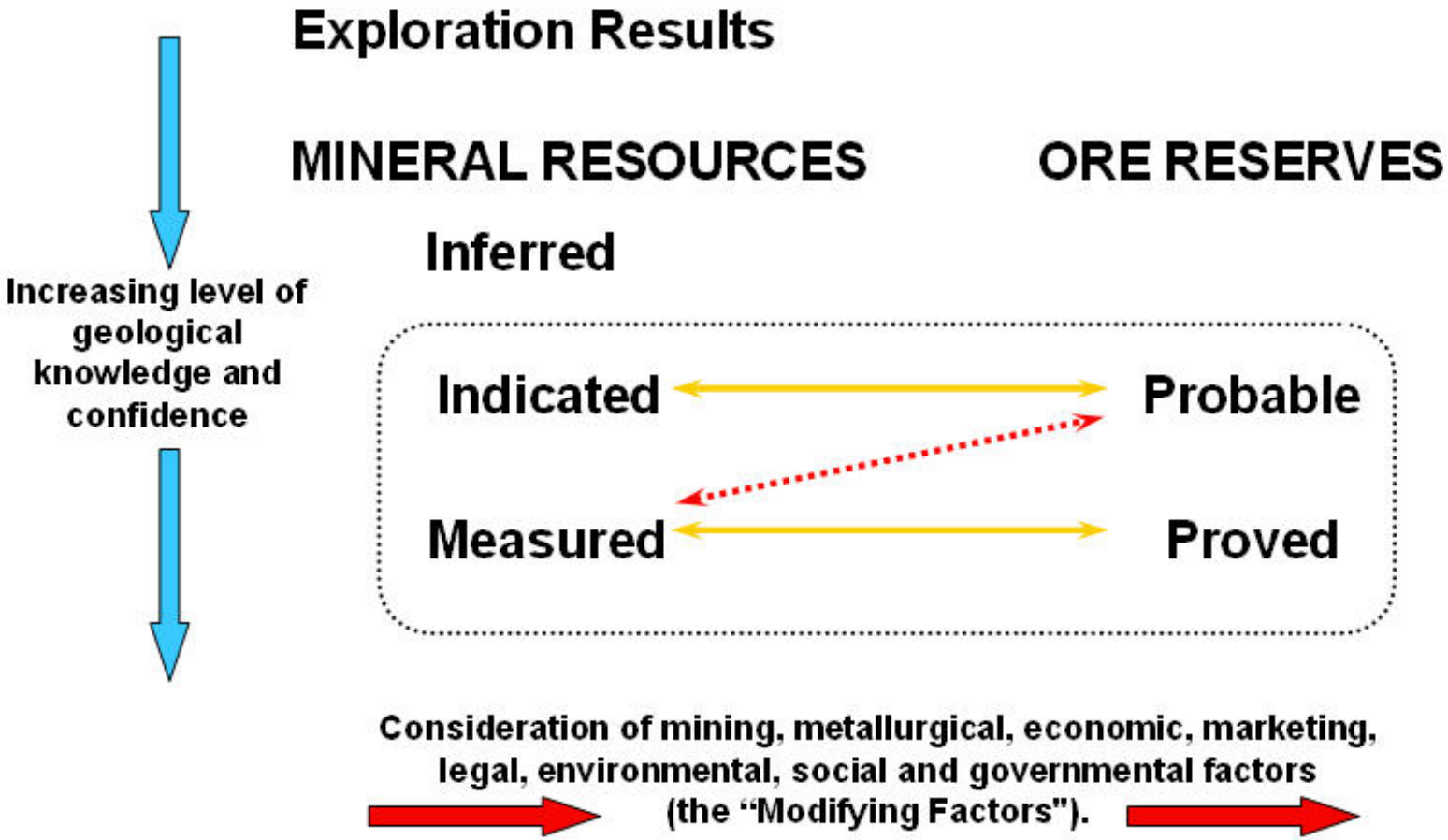
Competent Person

- Estimation of Mineral Resources may be a team effort (for example, involving one person or team collecting the data and another person or team preparing the estimate).
- Estimation of Ore Reserves is very commonly a team effort involving several technical disciplines.

- If only one Competent Person signs that person is responsible and accountable for the whole of the documentation under the Code. It is important that the Competent Person is satisfied that the work of the other contributors is acceptable.

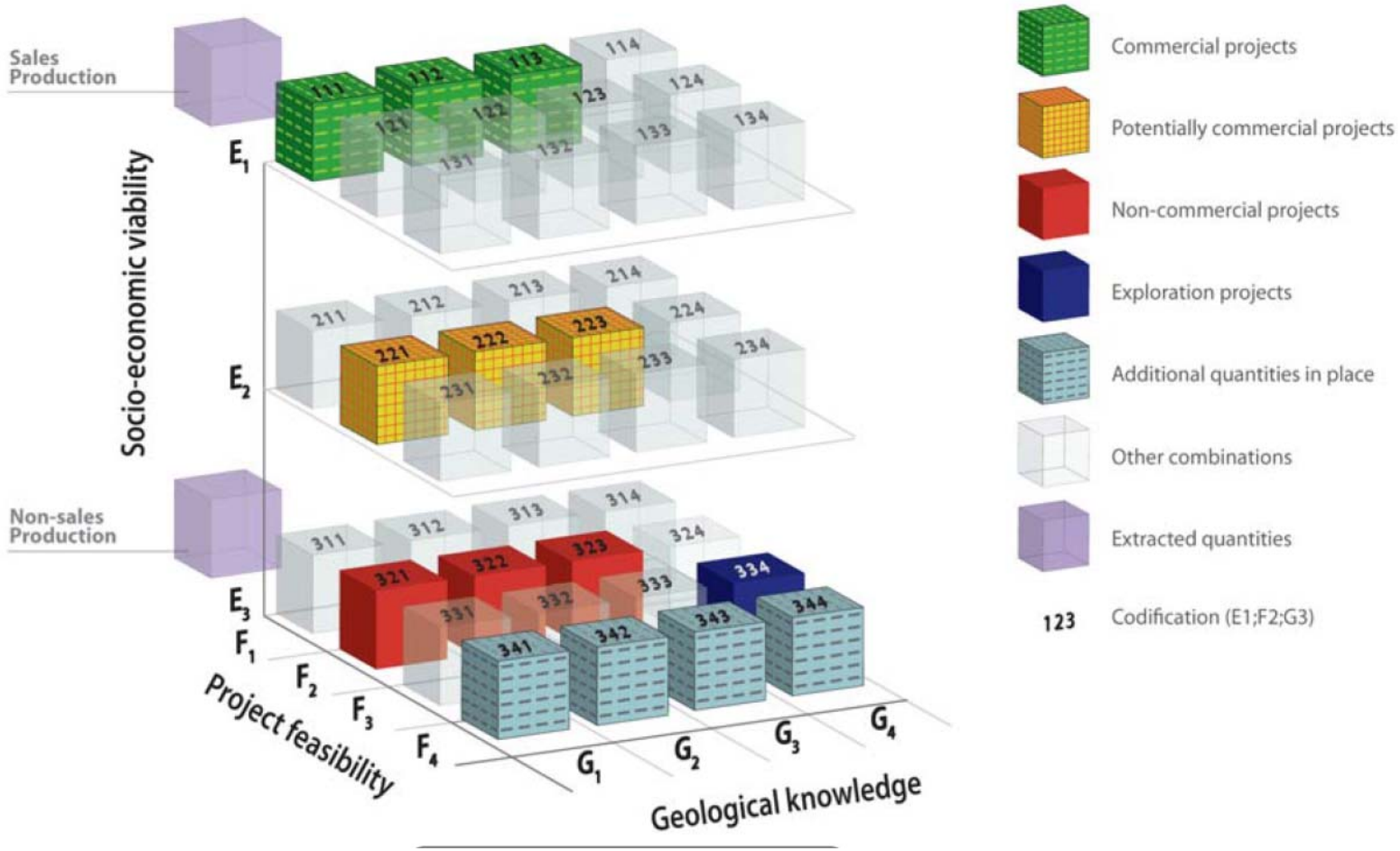
Source: JORC Code, 2012 Edition.

Relationships between Exploration Results, Mineral Resources and Ore Reserves



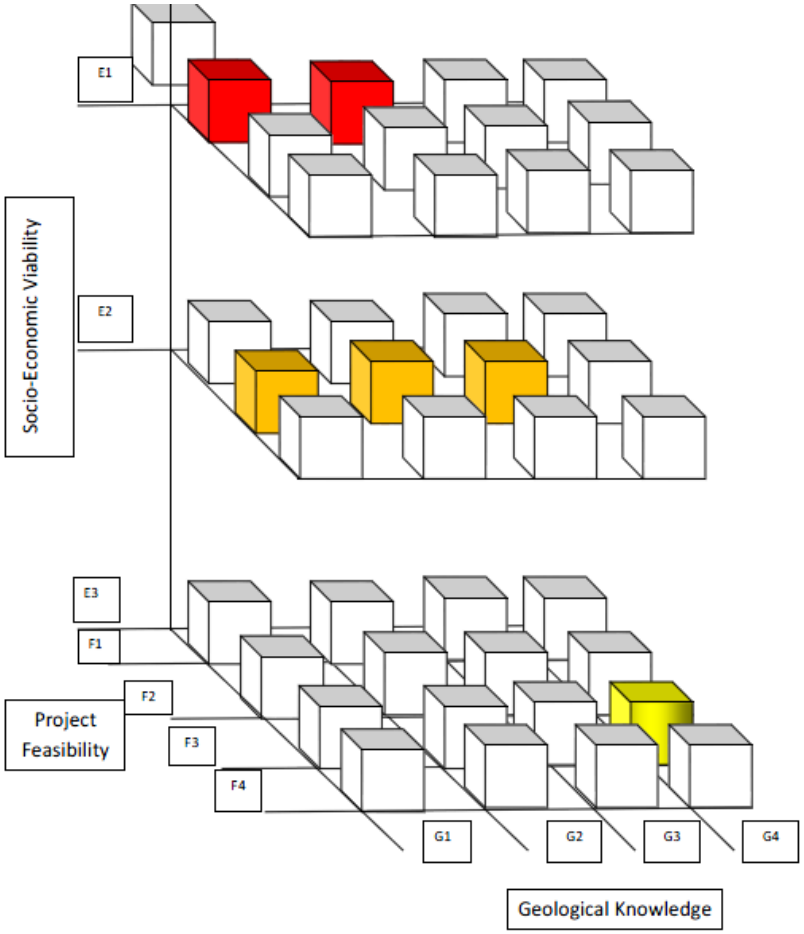
United Nations Framework Classification (UNFC)

2009 - UN Framework Classification



Source: UNFC 2009 ECE Energy Series No.39.

UNFC – CRIRSCO mapping



MAPPING:
111 = Proved Reserves
112 = Probable Reserves
221 = Measured Resources
222 = Indicated Resources
223 = Inferred Resources
334 = Exploration Results

Source: Reserves classification systems around the world. Henley and Allington 2012.

UNFC

- **A Generic Classification Framework for solid minerals and oil and gas.**
  - **Framework classification not a reporting standard - no underlying principles as a reporting standard,**
  - **No securities recognition**
  - **No Certification of Competency – does not define a Competent Person who takes personal responsibility for estimates.**
  - **Includes "Undiscovered" & "Uneconomic" material**
- **An important tool for global and governmental communication**
- **Provides a neutral framework for mapping from/to complete reporting systems (such as CRIRSCO and PRMS)**

Source: Henley. EU meeting Brussels 14 May 2013 and Lambert Bngkok

Conclusion

Top 5 Listed Mining Companies

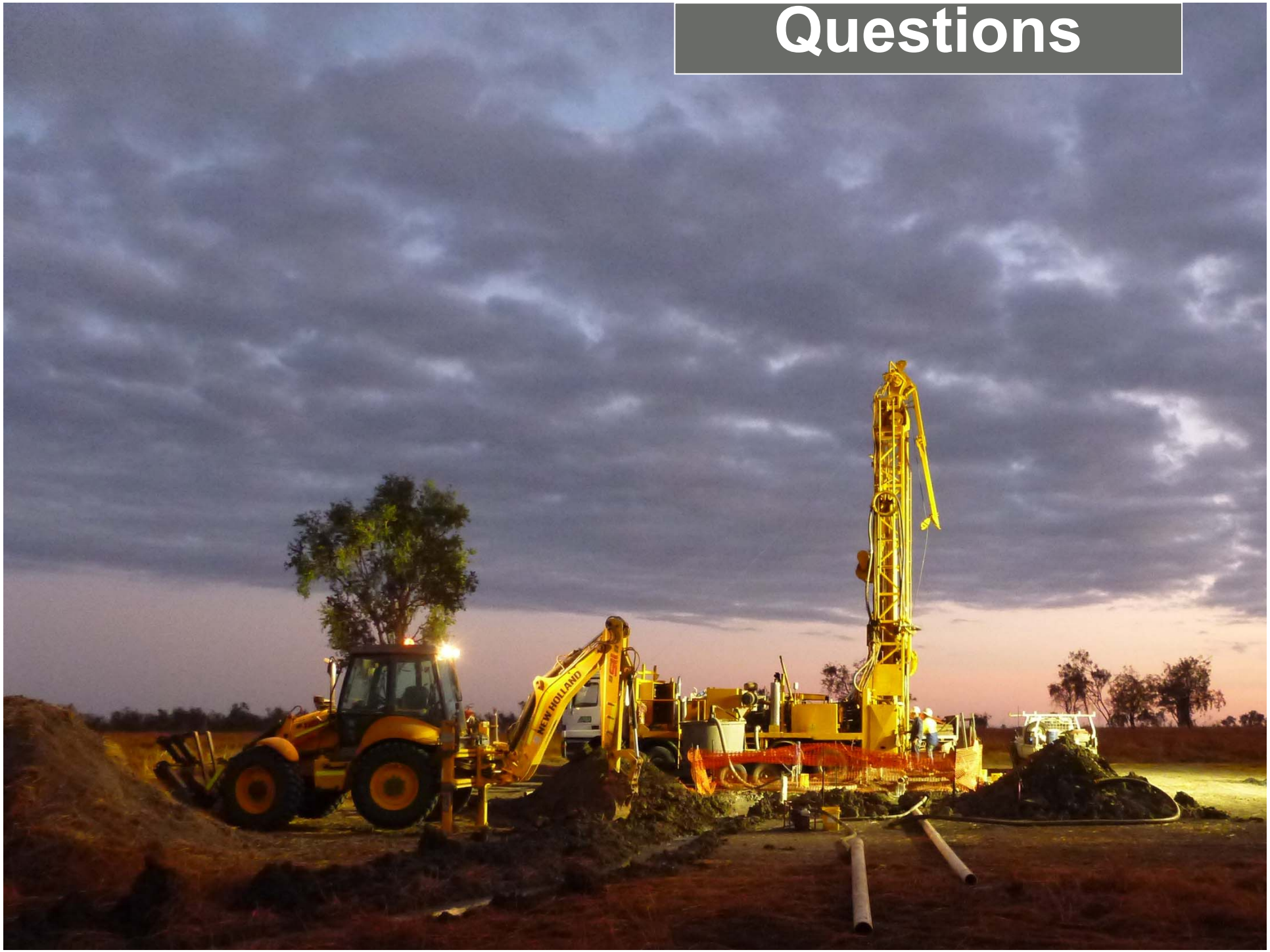
Primary and secondary Listing	Company	Reporting Code
Australia (ASX) London (LES prem)	BHP Billiton	JORC (DLC structure)
San Paulo NYSE	Vale	Multiple
Australia London (primary)	Rio Tinto Ltd Rio Tinto PLC	JORC (DLC structure)
London Johannesburg	Anglo American Anglo Gold Ashanti	JORC and SAMREC
LES NYSE	Glencore X-Strata Freeport-McMoran	JORC JORC

Source: 2012 company annual reports.

Conclusions

- **Adhering to CRIRSCO family codes and guidelines has a number of benefits**
  - **…….aside from obeying the law**
  - **Helps with raising capital**
  - **Removes the question of whether or not the competent person should include certain information. The checklist of assessment and reporting criteria (table 1) under many member codes is an if not why not? All subjects in the tables must be addressed**
- **The mapping of UNFC, CRIRSCO and PRMS has advanced considerably in the last few years.**
- **CRIRSCO is well accepted throughout many parts of the world for the reporting of mineral resources and minerals reserves.**

Questions



Exploration Results

- An Exploration Target is a **statement or estimate of the exploration potential of a mineral deposit in a defined geological setting** where the statement or estimate, quoted as a **range of tonnes and a range of grade (or quality),** relates to mineralisation for which there has been insufficient exploration to estimate a Mineral Resource.
- Need to state basis for target size reported.
- Clearly state assumptions used.
- Clarification statement – that there is insufficient exploration to estimate a mineral resource and that it is uncertain if subsequent exploration will result in an estimation of mineral resources.
- Proposed exploration and timeframe for completion.
- Competent Person statement is obligatory.

Source: JORC Code, 2012 Edition.

What is a Resource?

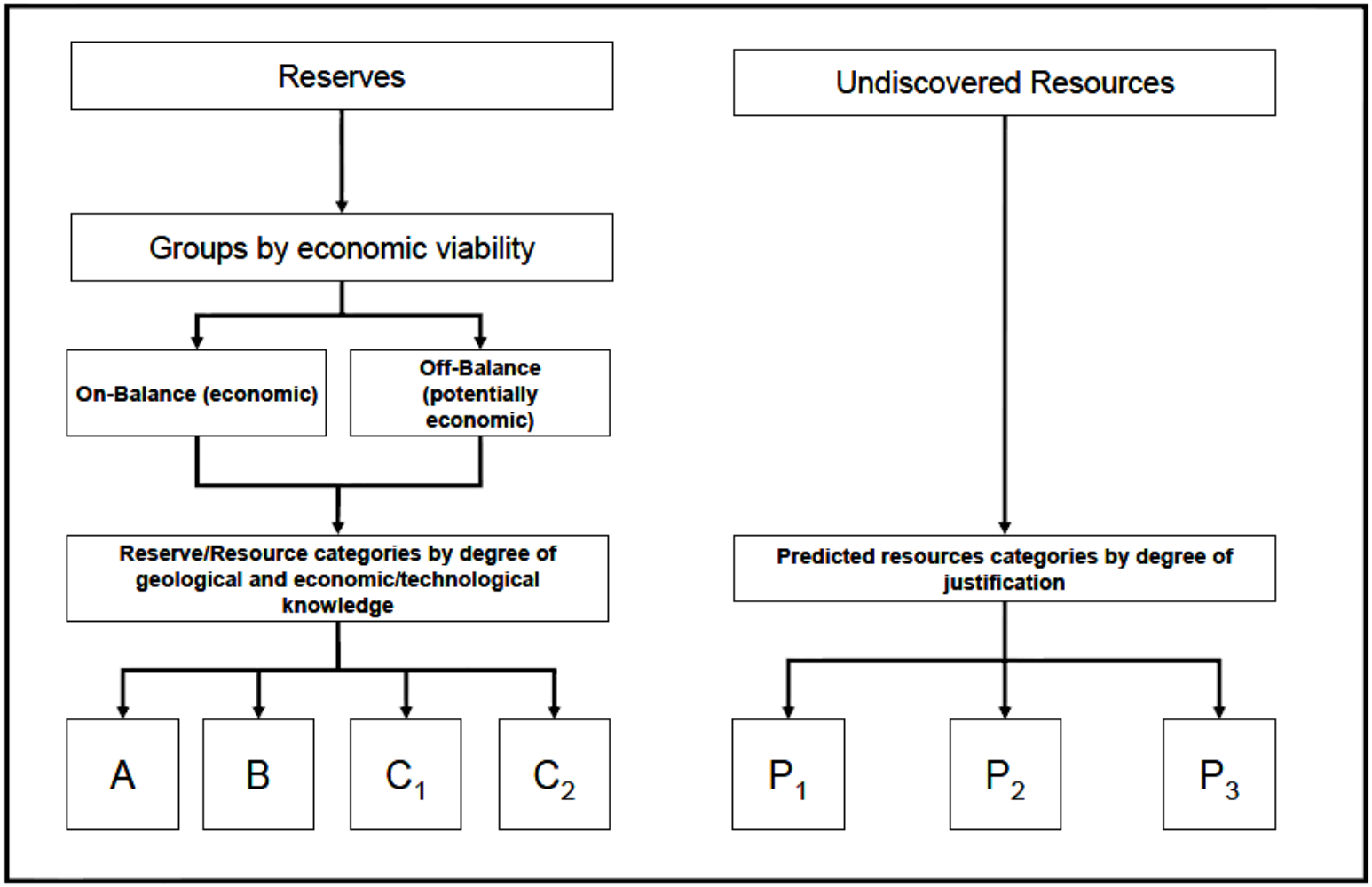
- A ‘Mineral Resource’ is a concentration or occurrence of material of economic interest in or on the Earth’s crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction.
  - Not an inventory of all mineralization
  - Further work can convert Resources to Reserves
- Geological and grade continuity are 2 variables important variable in classification of resources they can be dependent or independent
  - Implied continuity – Inferred resource
  - Assumed continuity – Indicated resource
  - Confirmed continuity – Measured resource

What is an Ore Reserve?

- An ‘Ore Reserve’ is the **economically mineable part of a Measured and/or Indicated Mineral Resource.**
- It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is **defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors.**
- Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.
- The reference point at which Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated.

JORC prefers the term ‘Ore Reserve’ because it assists in maintaining a clear distinction between a ‘Mineral Resource’ and an ‘Ore Reserve’, whereas other codes feel it is better to reference Mineral Exploration Results, Mineral Resources and Mineral Reserves.

Russian Federation System (GKZ – Geological Comission of Resources)

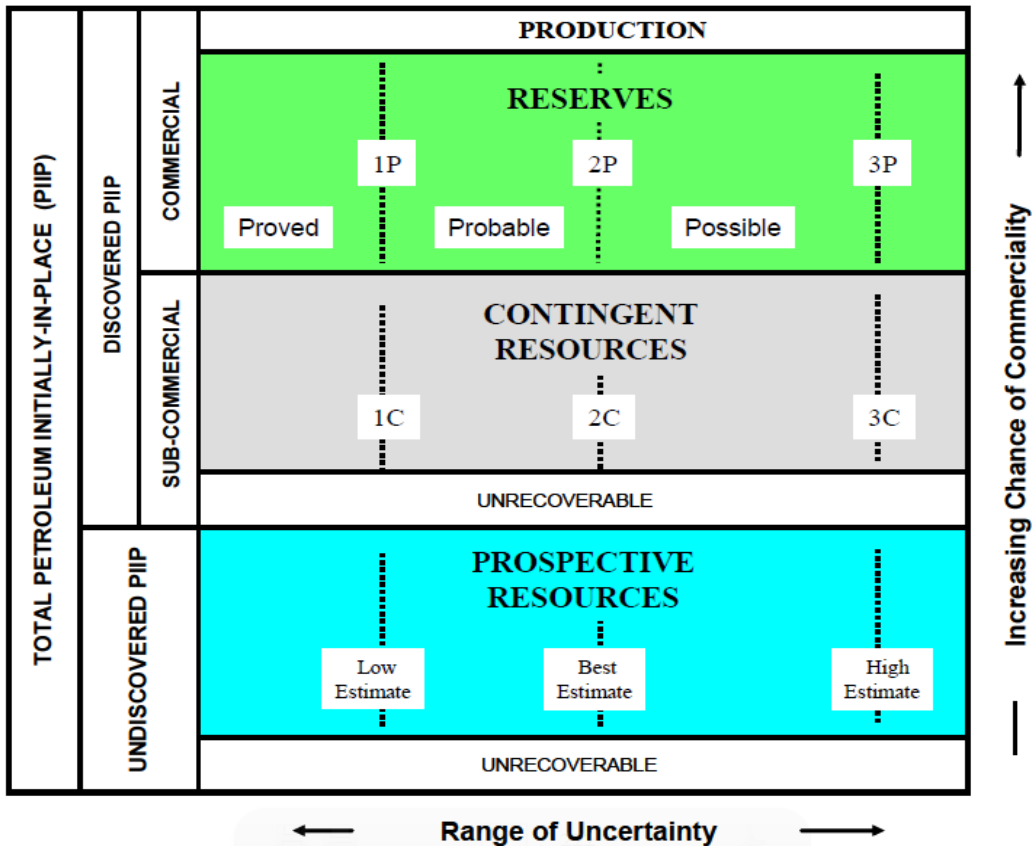


Source: World Mining Congress and Expo 2008. Weatherstone

CRIRSCO – Russian Classification Mapping (NAEN Code)

CRIRSCO	Russian System
Proven Reserve	A and or B plus economic feasibility study
Probale Reserve	A and or B plus intrinsically economic pre-feasibility study
Measured Resource	A and B
Indicated	C1
Inferred	C2
	Undiscovered
Exploration Results	P1
	P2 and P3

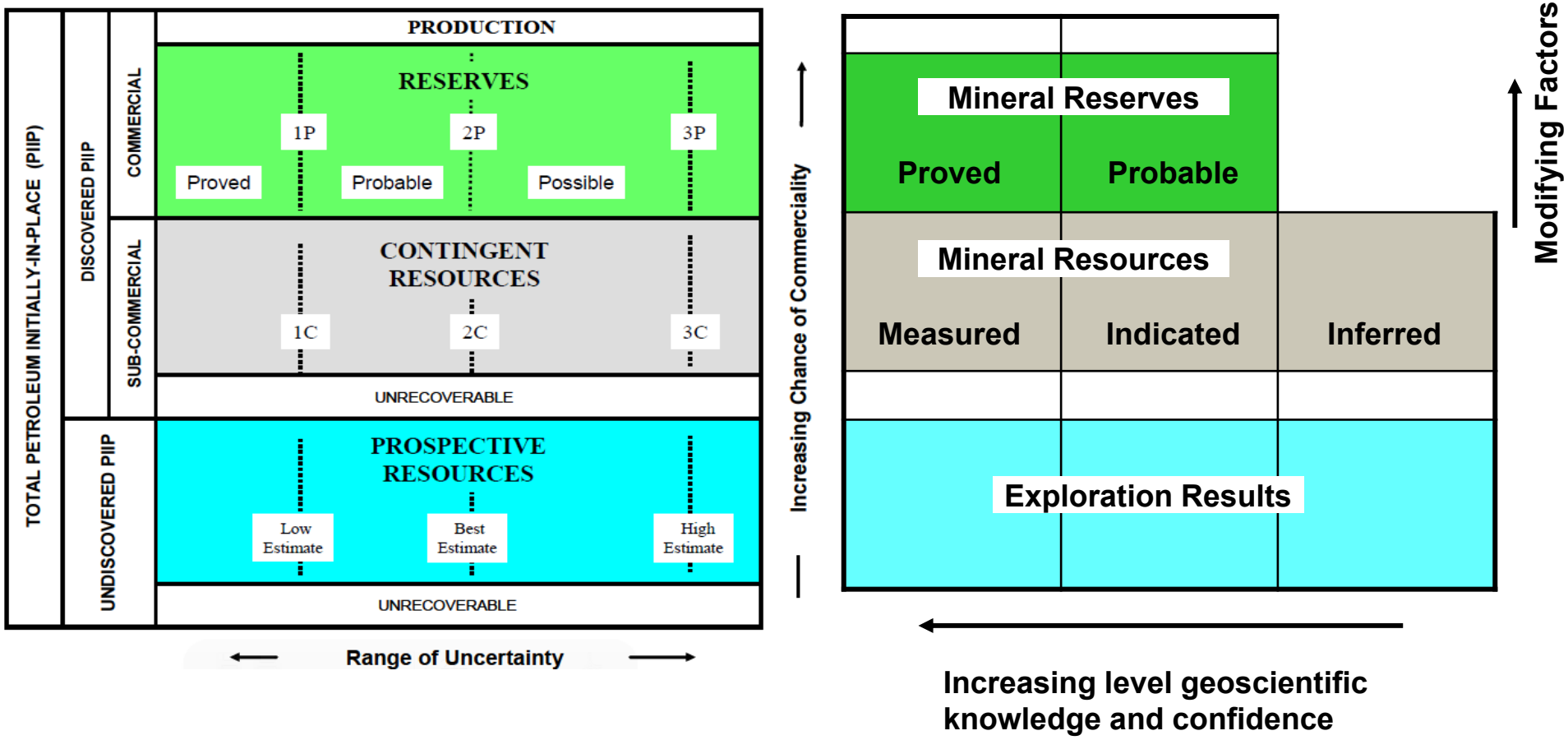
2011 - Petroleum Industry



- PRMS (petroleum resources management system) is based on an explicit distinction between (1) the development project that has been (or will be) implemented to recover petroleum from one or more accumulations and, in particular, the chance of commerciality of that project; and (2) the range of uncertainty in the petroleum quantities that are forecast to be produced and sold in the future from that development project.

Source: Guidelines for Application of the Petroleum Resources Management System SPE/AAPG/WPC/SPEE,SEG. November 2011.

PRMS – CRIRSCO Mapping



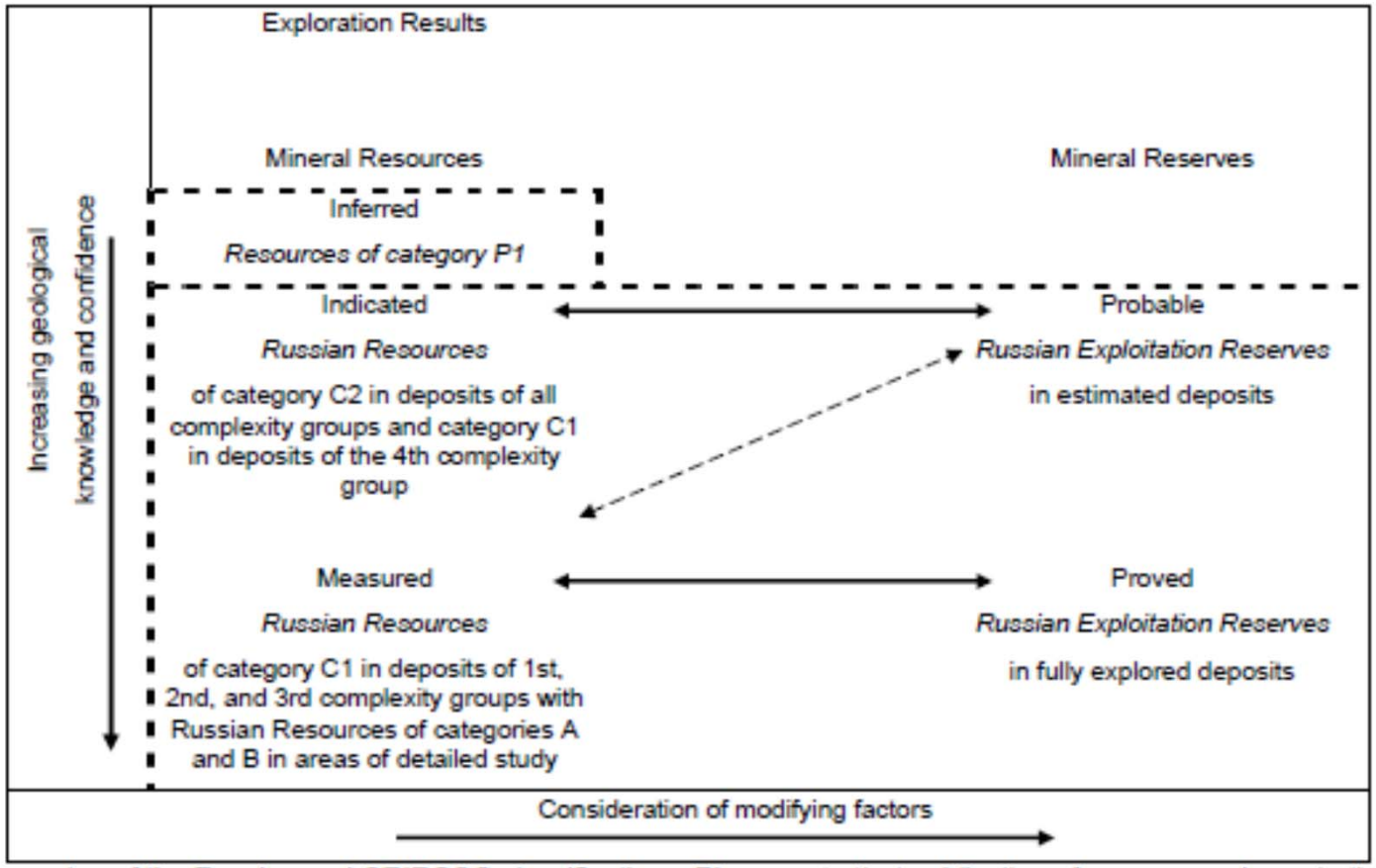


Figure 4 A mapping of the Russian and CRIRSCO classifications. Please note that publication of any conversion, whether it follows these guidelines or differs from them, requires signoff by a Competent Person