

Mapping between China's Classification for Mineral Resources and Reserves and CRIRSCO's classification



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Outline

I. Introduction of China's Classification (CCMR-1999)

II. Introduction of CRIRSCO classification

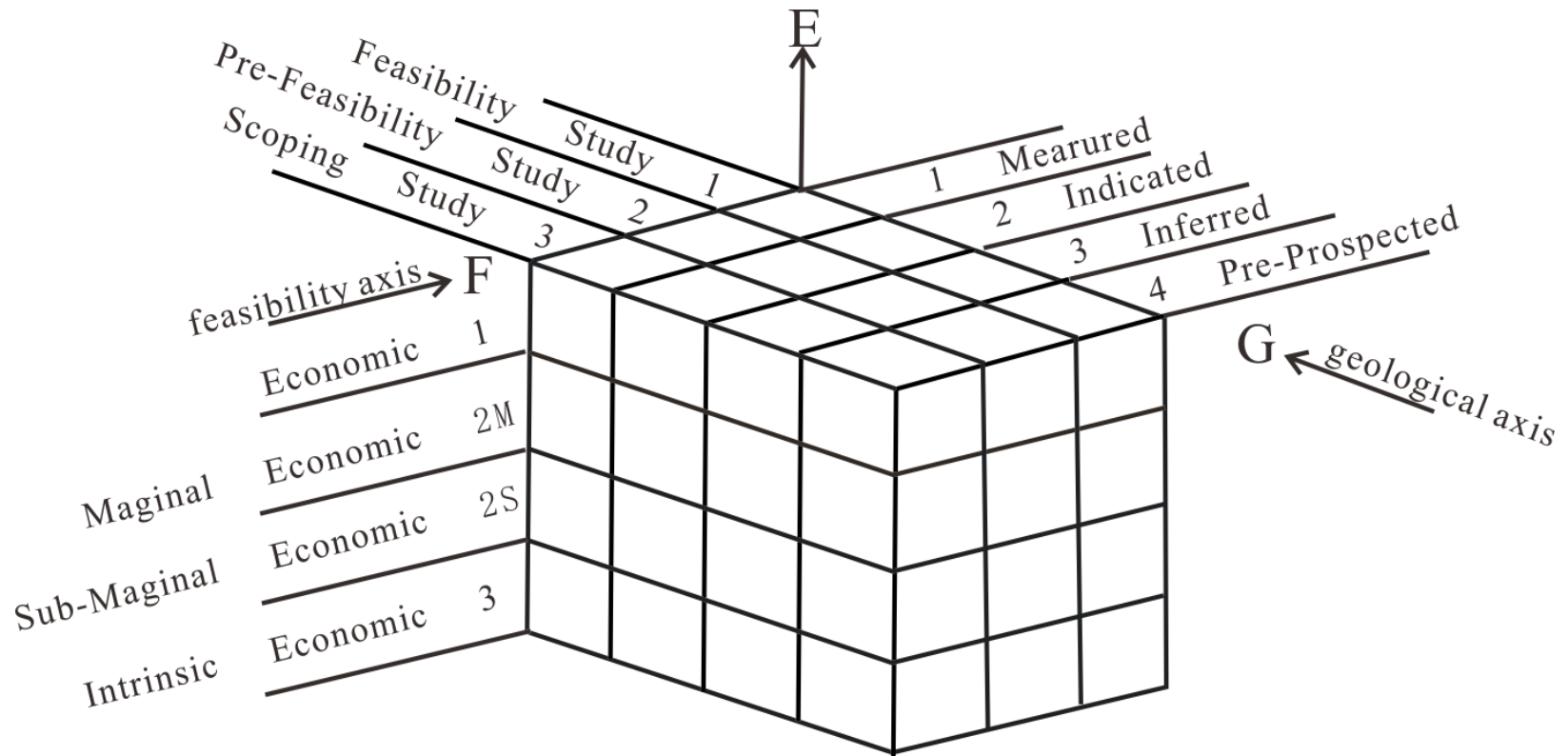
III. Definition Mapping

IV. Case Study

V. Suggestion



I. Introduction of CCMR-1999



Three Axis System

E—Economic Viability

F—Feasibility Assessment

G—Degrees of Geological Assurance

Table of CCMR-1999

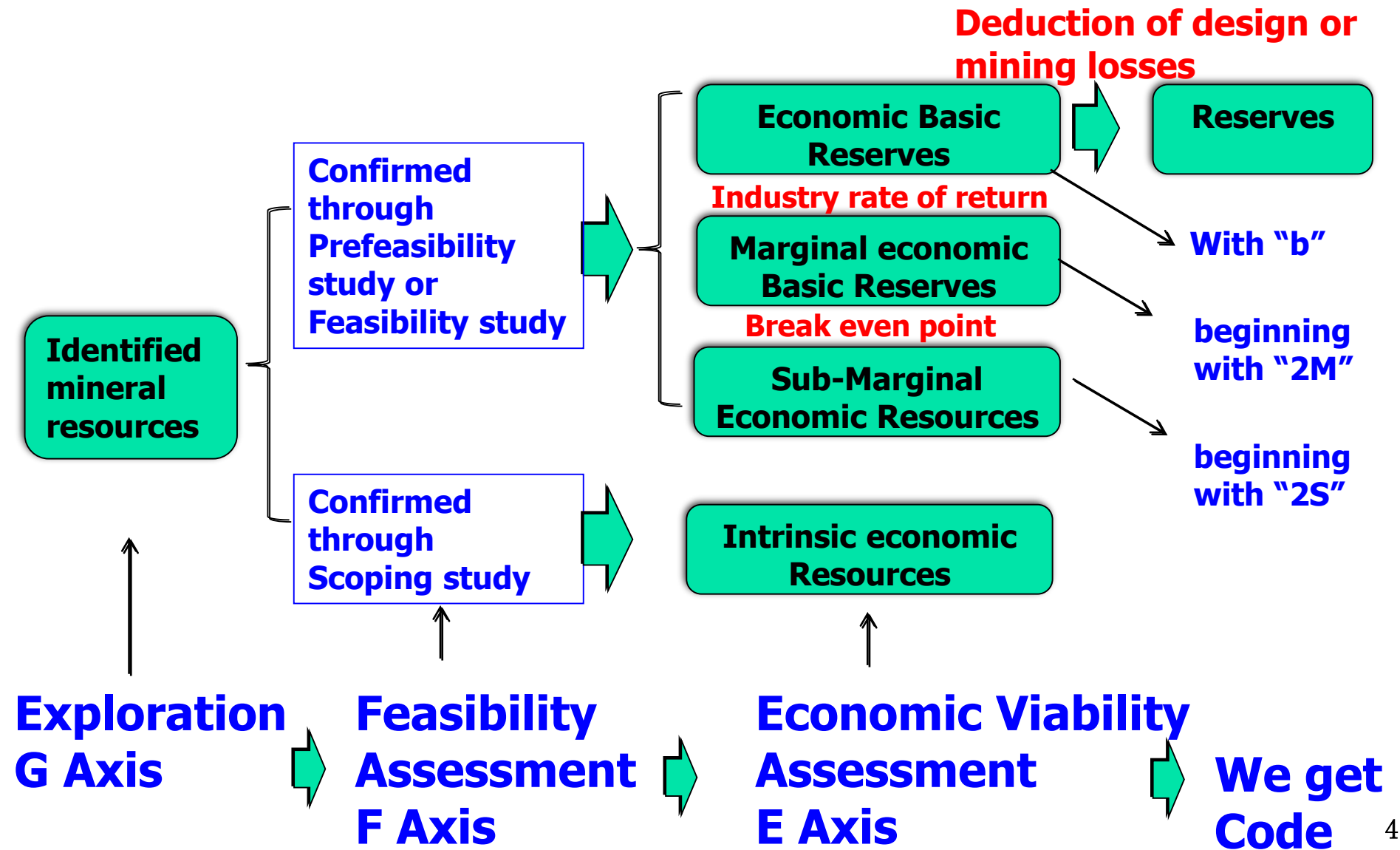
<div>Degree of Geological Assurance</div> <div>Classification</div> <div>Category</div> <div>Degrees of Economic Viability</div>	Identified Mineral Resources			Undiscovered Resources
	Measured	Indicated	Inferred	Pre-Prospected
Economic	Proved Reserves (111)			16 categories
	Basic Reserves (111b)			
	Probable Reserves (121)	Probable Reserves (122)		
	Basic Reserves (121b)	Basic Reserves (122b)		
Marginal Economic	Basic Reserves (2M11)			
	Basic Reserves (2M21)			
Sub-Marginal Economic	Resources (2S11)			
	Resources (2S21)			
Intrinsic Economic	Resources (331)	Resources (332)	Resources (333)	Resources (334)?

4 classes

16 categories

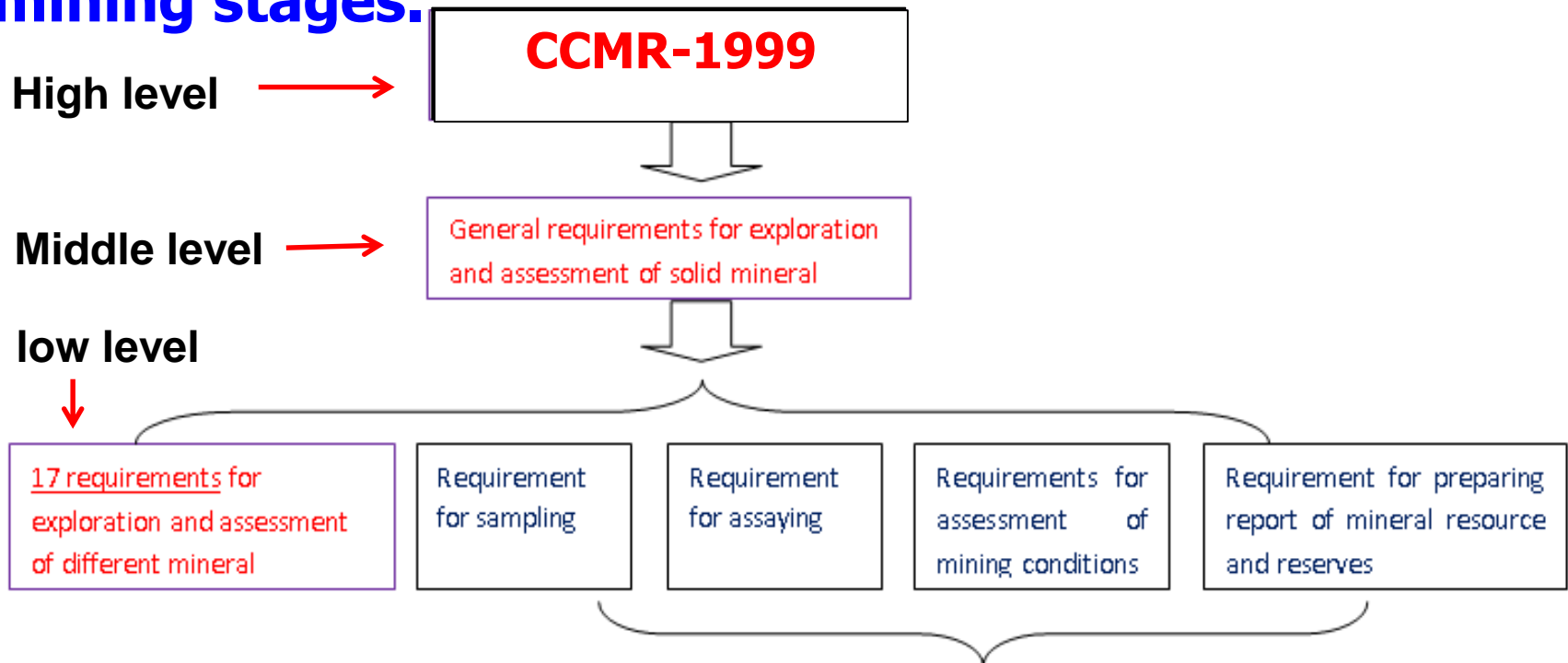
The codes are always quoted in the same sequence, EFG.

How does CCMR-1999 work



Characteristic of CCMR-1999 and its Application

CCMR-1999 is not a isolated national standard but the **key of a classification system for exploration and mining stages.**



These are specifications for application of classification standards to different mineral.

These are maturing standards of classification standards.

Such as Requirement for exploration and assessment of rock gold, coal, copper, lead, etc., al.

KCS 73-010
D 10



中华人民共和国国家标准

GB/T 17766—1999

固体矿产资源/储量分类

Classification for resources/reserves of
solid fuels and mineral commodities

1999-06-08 发布

1999-12-01 实施

国家质量技术监督局 发布

KCS 73-010
D 10



中华人民共和国国家标准

GB/T 13908—2002

固体矿产地质勘查规范总则

General requirements for solid mineral exploration

2002-08-28 发布

2003-01-01 实施



中华人民共和国
国家质量监督检验检疫总局 发布



中华人民共和国地质矿产行业标准

DZ / T 0214—2002

铜、铅、锌、银、镍、钼矿地质勘查规范

Specifications for copper, lead, zinc, silver,
nickel and molybdenum mineral exploration

2002-12-17 发布

2003-03-01 实施

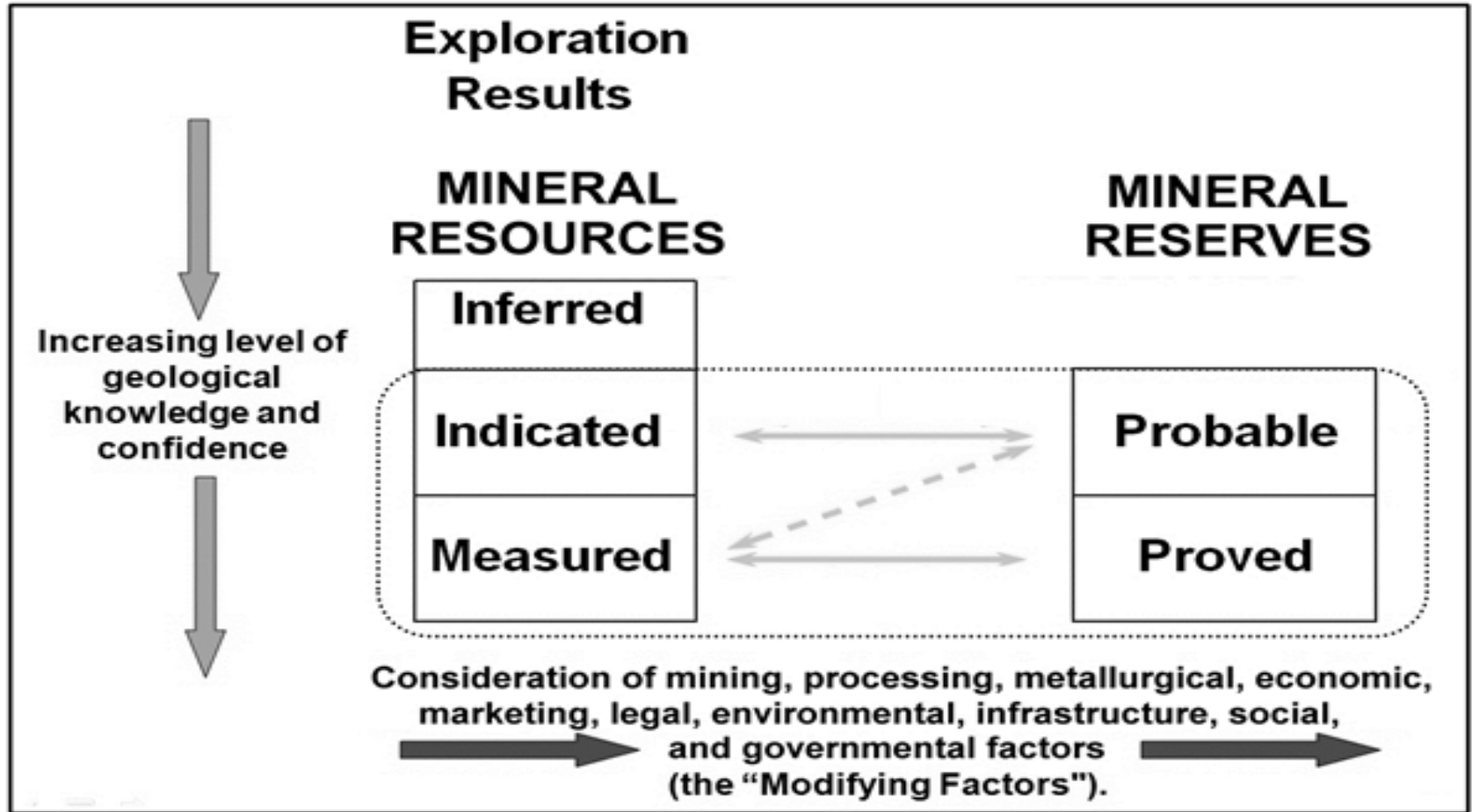
中华人民共和国国土资源部 发布

Correspondence between mineral exploration stages, its aim, application of industry index and classification of mineral resources and reserves

Mineral Exploration Stages	Aim	application of industry index	Classification
Pre-Prospecting	find an area with greater potential for mineralization	General industrial index	(334)?
Prospecting	find a deposit	General industrial index	(333) and (334)?
General Exploration	make a judgement whether the project has any commercial value or not	confirmed industrial index	if it has commercial value , (332),(333) and less (334)? If it has not, the exploration project are finished, but no resources to be registered into national resources and reserve base.
Detailed Exploration	do detail exploration to provide grounds for a Feasibility Study or mine development and design	confirmed industrial index	(331),(332) and (333)

II. Introduction of CRIRSCO classification

Figure. General relationship between Exploration Results, Mineral Resources and Mineral Reserves



The definitions in this edition of the International Reporting Template are either identical to, or not materially different from those definitions used in the countries represented on the CRIRSCO committee.

III. Definition Mapping

Table . Mapping between CCMR-1999 and CRIRSCO Classification

Chinese Classification			CRIRSCO Classification		
Category	Sub-Category	Class	Category	Class	
Mineral Reserves	Economic	(111)	Mineral Reserves	Proved	
		(121)		Probable	
		(122)			
Basic Reserves		(111b)	Not defined in CRIRSCO Template		
		(121b)			
		(122b)			
	Marginal Economic	(2M11)			
		(2M21)			
		(2M22)			
		Mineral Resources			
(2S21)					
(2S22)					
Intrinsic Economic	(331)		Mineral Resources	Measured	
	(332)			Indicated	
	(333)			Inferred	
	(334) ?	Exploration Results			



Feasibility Study

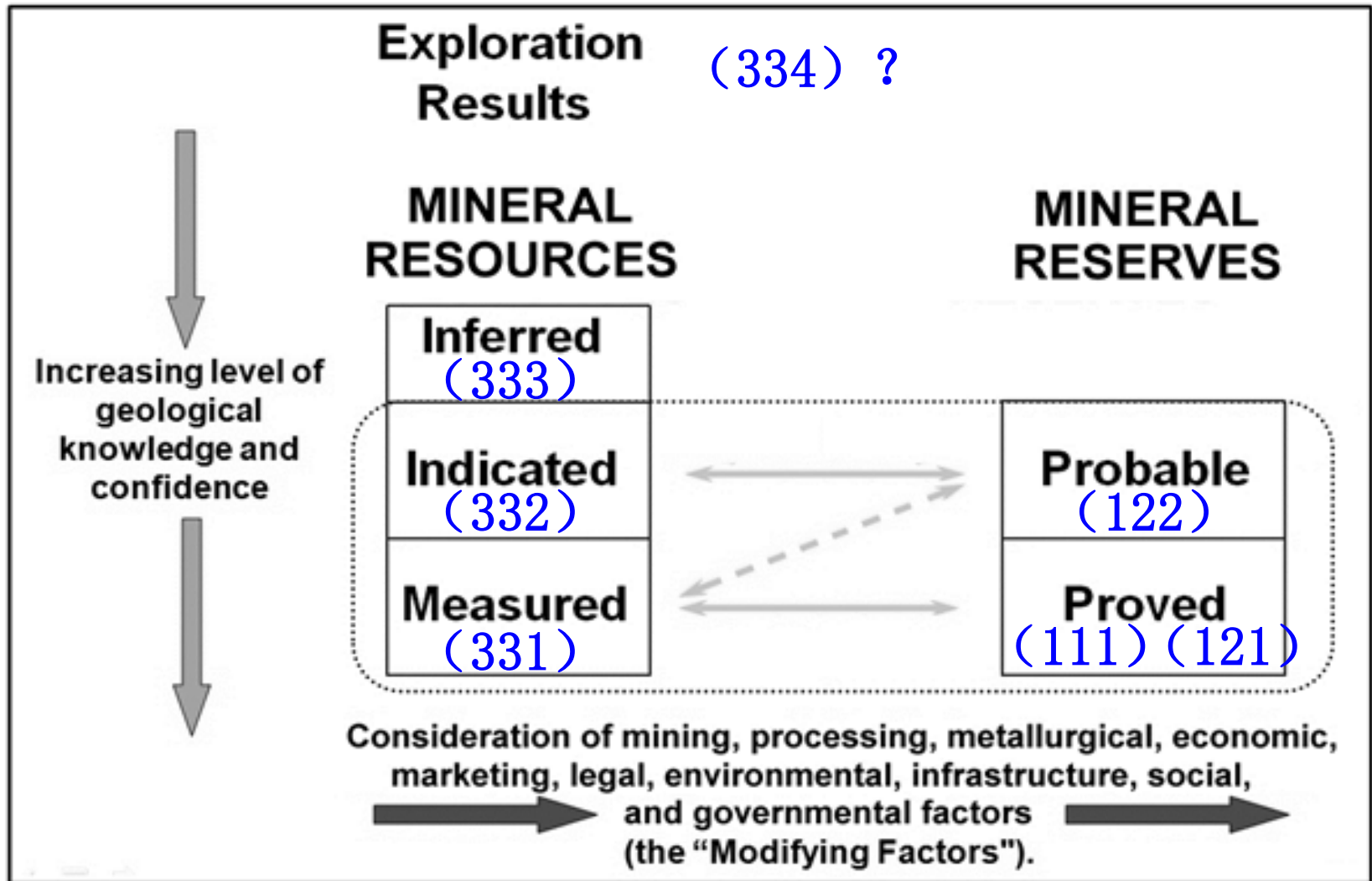


Pre-Feasibility Study



Scoping Study

Figure . Mapping between CCMR-1999 and CRIRSCO Classification



Differences of two systems

Two systems are similar to each other in the definitions of mineral resources and mineral reserves, but different in following ways:

1. **Different service targets:** CCMR-1999 serves national management of resources and the domestic capital market of mining industry, but CRIRSCO's classification is mainly prepared for capital market.
2. **Different definitions of terms:**
 - a. **pre-prospected resources (334)?** in CCMR-1999 is economic-interest undefined we can estimate its quantity but can not list on the State data base of mineral resources and reserves; **CRIRSCO's classification defines the resources** with the similar degree of geological knowledge and confidence **as the exploration result.**

Differences of definitions of two systems

b. (333) Resources in CCMR-1999 include the part extrapolated by measured (331) and indicated resources (332) or basic reserves (111b, 122b etc.); CRIRSCO's inferred mineral resources don't include such part.

c. (331), (332) and (333) in CCMR-1999 have the definite requirements for the performance of mineral processing, of mineral deposit exploitation technology, and technical studies ; CRIRSCO's classification of resources doesn't have the definite requirements.

d. The reserves in CRIRSCO's classification contain depleted materials involved in the mining process, but China's classification doesn't include such materials.

Differences of definitions of two systems

e. China's classification standard only permits the conversion from the proved basic reserves to (111) with technological feasibility and economic rationality as proved in the feasibility study; but CRIRSCO's classification implies the circumstances where ten "Modifying Factors" in pre-feasibility study can be determined, and measured resources can also be converted to proved reserves.

f. CRIRSCO's classification permits the two-way conversion between resources and reserves in a given condition, but China's classification only allows for the single-way classification.

g. The feasibility study in CRIRSCO classification focuses on the conversion between resources and reserves, but China's feasibility study focuses on the feasibility demonstration of construction projects.

IV. Case Study

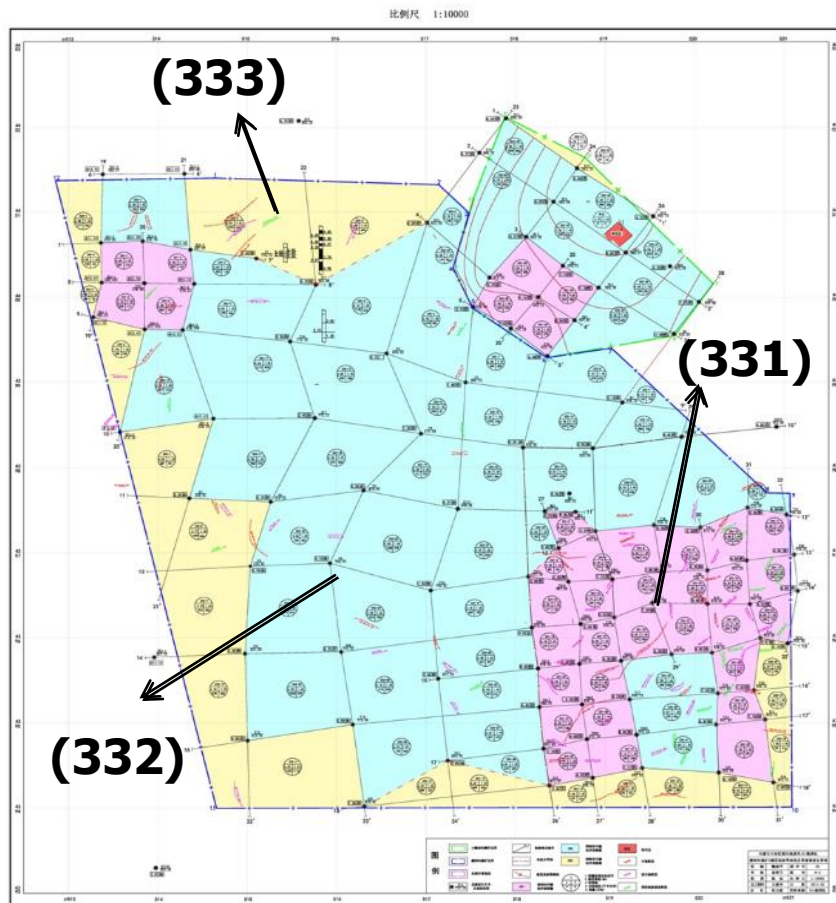
Case No1.

A coal mine located in north of china that has listed on Shanghai and Hong kong Stock Exchange.

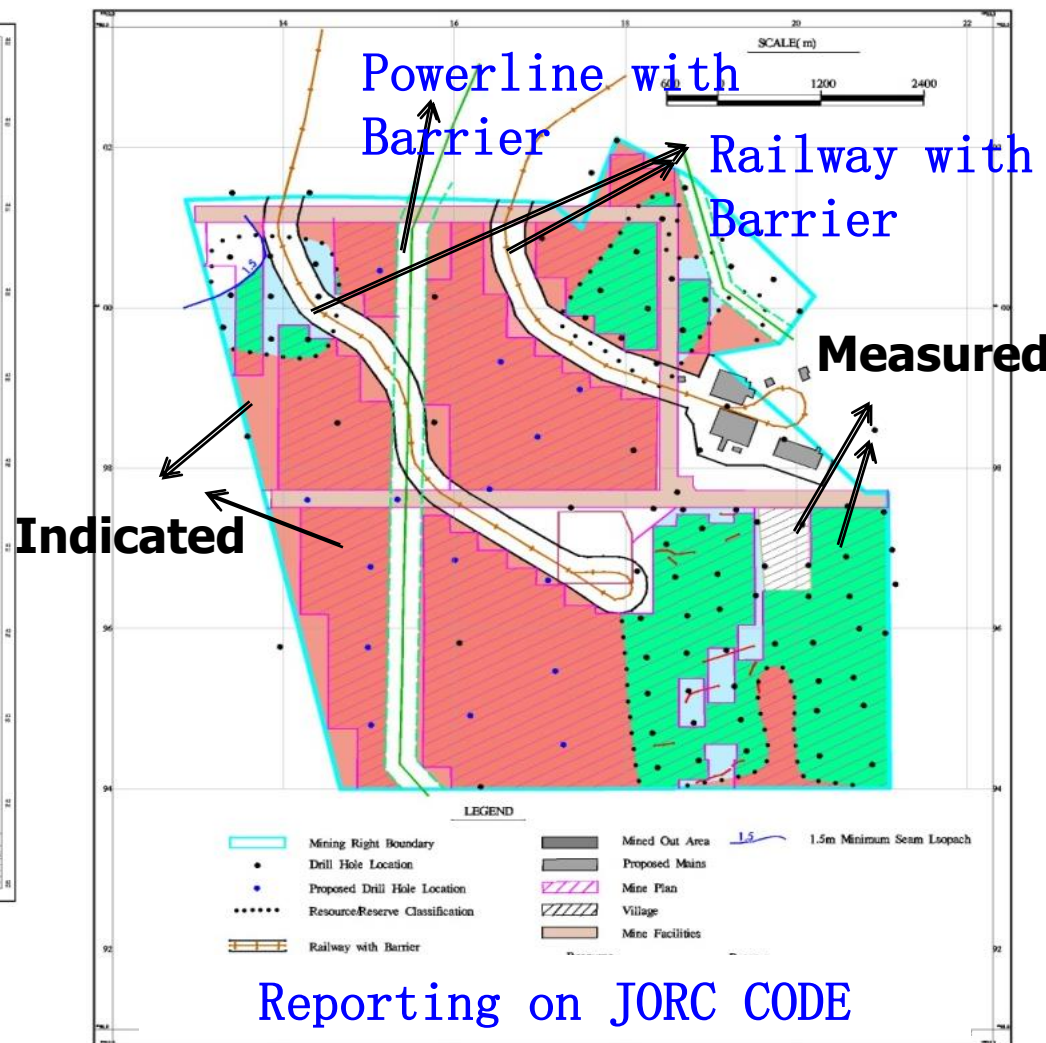
Stock Exchange	Shang Hai	Hong Kong
Classification Standard	CCMR-1999	JORC CODE
Mineral Resources(Coal,Mt)	(331)201.68 Mt (332)818.44 Mt (333)419.97 Mt Total: 1440.09 Mt	Measured 389.91 Mt Indicated 805.63 Mt Inferred 0 Mt Total: 1196 Mt
Minimum of thickness of coal seam (m)	0.8	1.5
Estimation of the number Coal Seam	5	4
Including Resources under Village, Railway or other places	Yes	No
Drill spacing for classification	(331):500m×500m (332):1000m×1000m (333):>1000m	Measured: 750m×750m Indicated: 1500m×1500m
Resources estimation method	geometric method	isopach method

Case No. 1

Mineral Resources/Reserves of No. 4 Seam



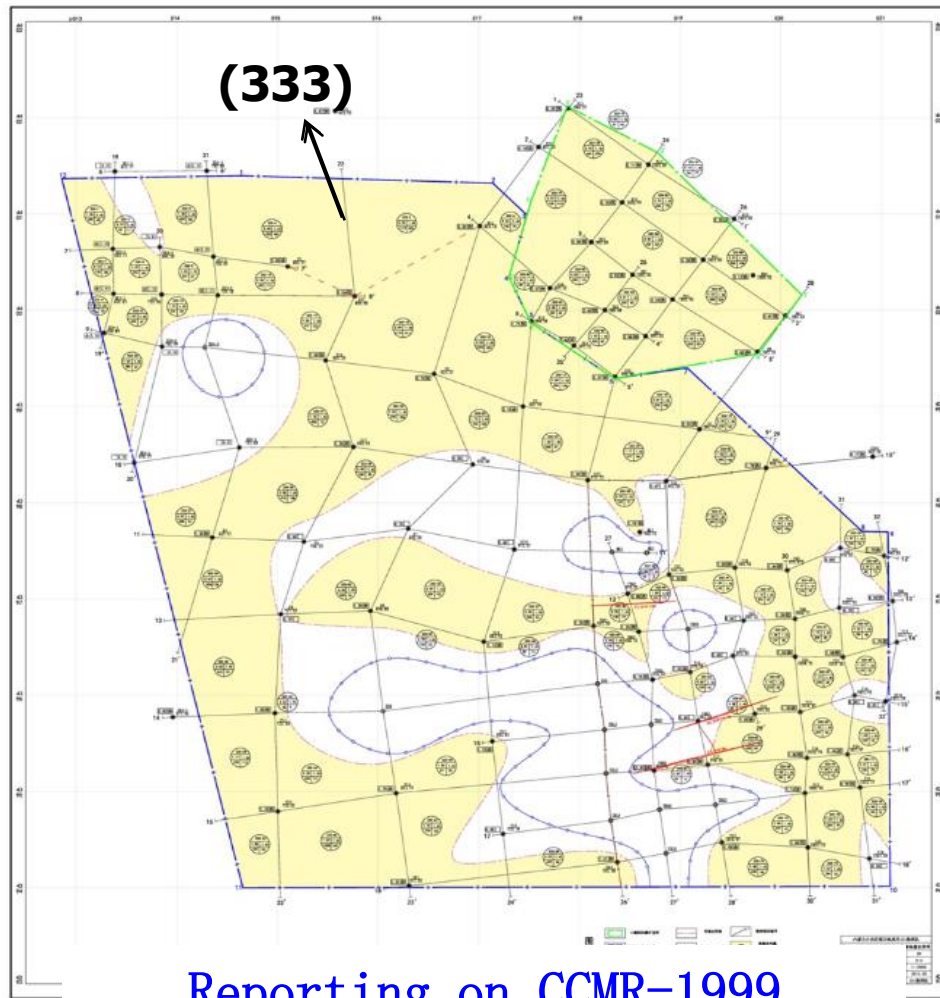
Reporting on CCMR-1999



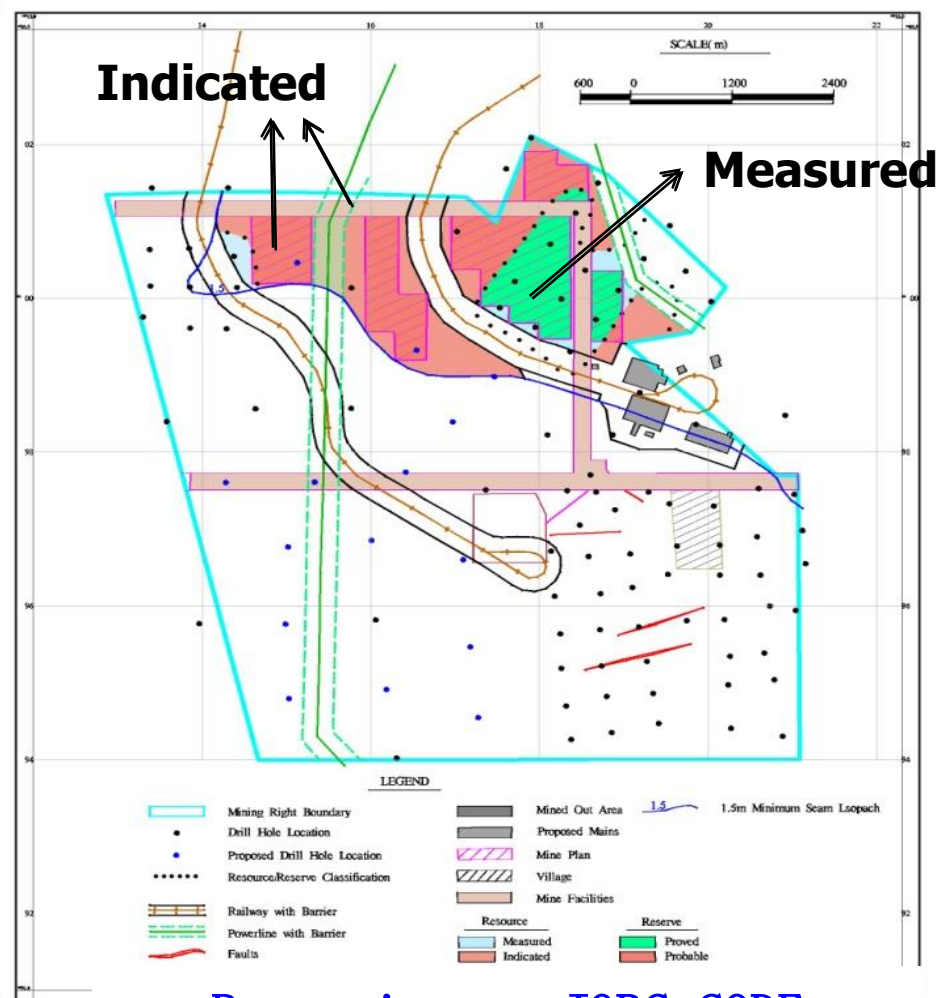
Reporting on JORC CODE

Case No. 1

Mineral Resources/Reserves of No. 5 Seam



Only (333)



Mineral Resources of No. 9 Seam



No Reporting on JORC CODE

Case No. 2

A Zinc/lead mine located in north of china that has listed on London Stock Exchange and its mineral resources and reserves have been listed in the National data base.

Mapping mineral resources reporting

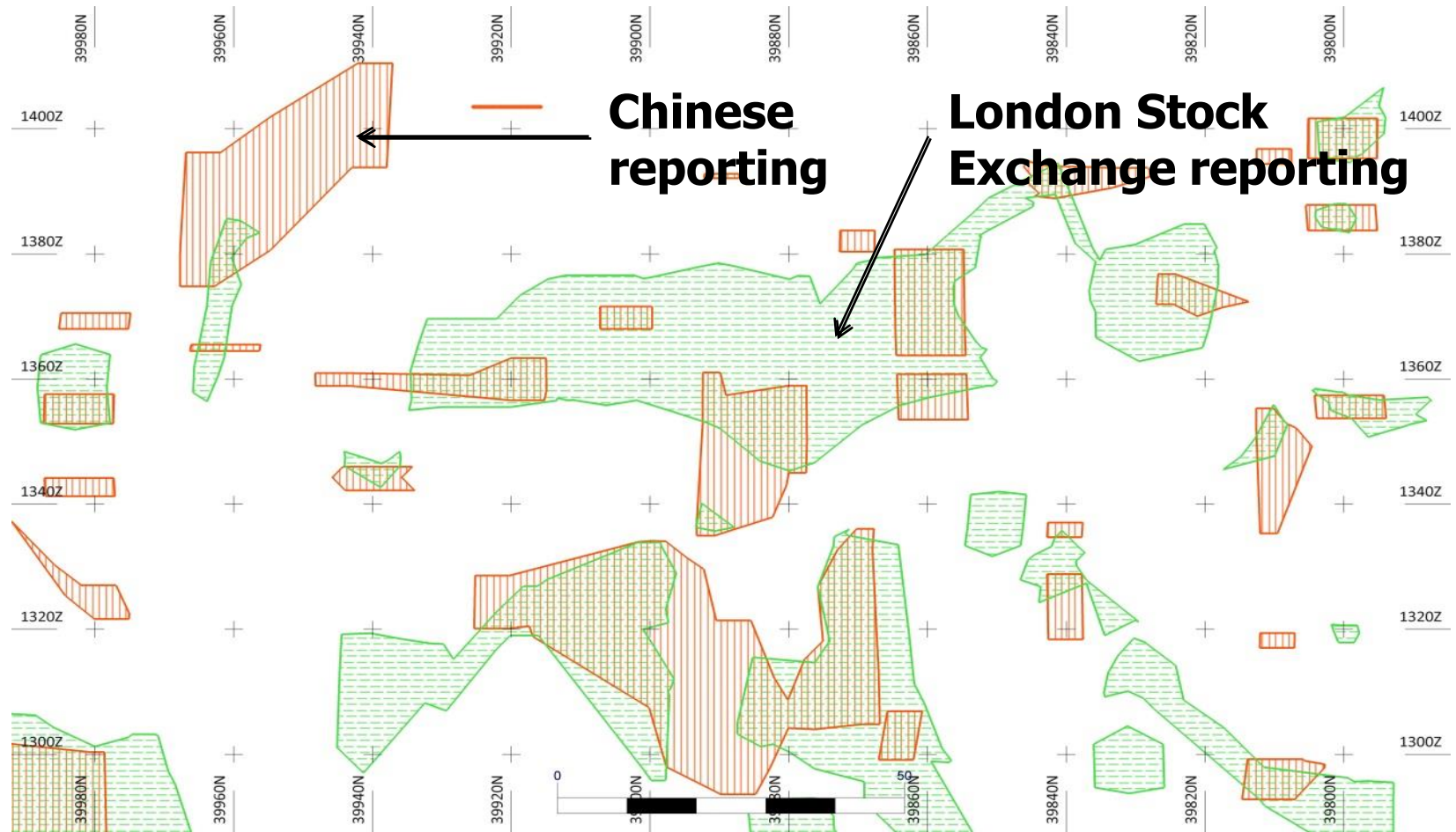
Reporting of Mineral Resources	To Chinese Government				On the London Stock Exchange			
Category	(331)	(332)	(333)	Total	Measured	Indicated	Inferred	合计
ORE (Mt)	1.74	3.76	9.83	15.34	0	4.1	15.6	19.6
Zn Metal(kt)	66.90	152.70	386.97	606.58	0	123	516	639
Metal Grade (%)	3.84	4.06	3.94	3.95	0	3	3.31	3.26

Case No. 2

Mapping estimation parameters

Reporting of Mineral Resources	To Chinese government	on London Stock Exchange
Classification Standard	CCMR-1999	JORC CODE
Zn cut-off grade	cut-off 0.5% industrial cut-off 1%	1%
Including Resources of small ore bodies far away from main ore body	Yes	No
Drilling space for classification	≤25m for (331) 25m to 50m for (332) > 50m for(333)	20m×10m for Measured 25m×25m for Indicated > 25m for Inferred
estimation method	geometric method	Ordinary kriging

Case No. 2



Two different standard, different ore body outline.

Case Study Knowledge

Different Competent persons or Qualified persons may have different reporting of mineral resources and reserves. Reporting in China, a classification system including exploration standards must be followed. The reporting results must be audited by experts group and confirmed by government. Personal randomness can be avoided to the utmost extent.

V. Suggestions

China has formed a set of well-developed technical standard systems of mineral resources and reserves and the well-established management systems of mineral resources and reserves under the framework of such technical standard systems. As the key factor of technical standard systems and the technical rule and regulation of mineral resources administration, Classification standard determines how the mineral resources are managed and the capital market operates in a country. Due to the historical reasons of economic system and management system, CCMR-1999 applies better to the government's management of resources, but not very well perform its roles in financial and capital market. In contrast, CRIRSCO classification turns more attention to the rules of commercialized operation in which market plays a dominant role. Thus, two classifications differ not only in technology, but also in operation and social system as well. So the suggestions for improvement are detailed as follows:

V. Suggestions

1. Maintain China's characteristics and advantages in the mineral resources exploration, assessment and estimation, strengthen the national management of mineral resources, and master the quantity and quality of mineral resources.

2. Learn from the common practices of international capital market, for example CRIRSCO Template, to improve the classification standard and its operation mechanism for the conversion between mineral resources and mineral reserves, to adjust the mode of management, and to perfect the rules of information disclosure of mineral resources and mineral reserves at capital market.

Thanks for your
comments



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