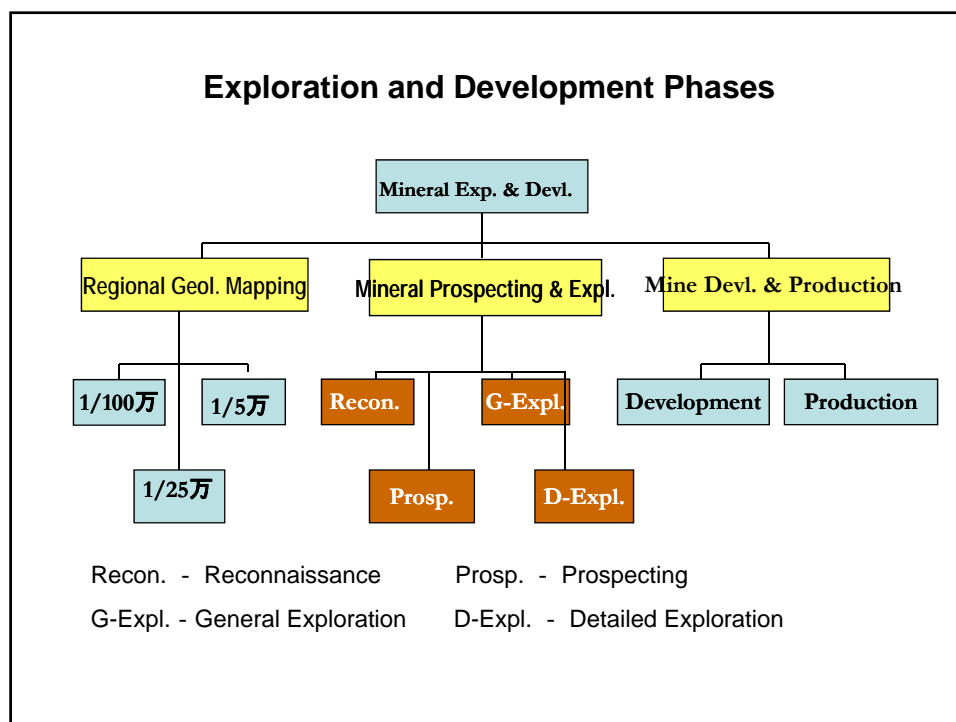


Exploration and Development Phases and Corresponding Supporting Standards, Codes and Guidelines in China

Yan Tiexiong

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Exploration Phases and the reconspending Standards, Codes,regulations and guidelines

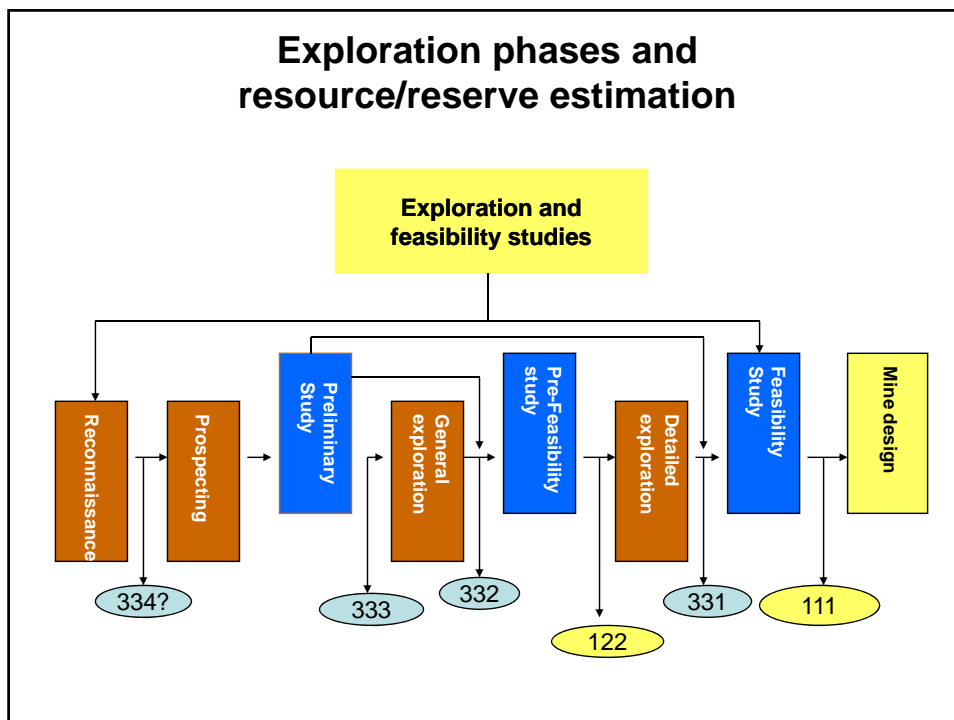
The final goal of exploration is to provide necessary mineral resource and reserve data and relative technical and economic information so that the mineral project would avoid investment risk and make reasonable interests.

| Reconnaissance | Prospecting | General Exploration | Detailed Exploration |
|----------------------------------|---|---|---|
| Looking for prospecting targets. | Preliminary evaluation for the prospecting mineralization area; defining the area for general exploration, if such prospecting is successful. | Systematic sampling, providing data for pre-feasibility study; defining the area for detailed exploration, if such general exploration is successful. | Use various and effective methods for dense sampling, providing data for feasibility study to determine mineral commodities, production rate, mining method, ore processing method, and metallurgical method. |

| Requirements for exploration phases | | | | |
|--------------------------------------|---|---|---|--|
| | Reconnaissance | Prospecting | General Exploration | Detailed Exploration |
| Geological Study and sampling | Discovering mineralization, analogy with known deposits, testing geophysical and geochemical anomalies by drilling or other exploration workings. | Preliminary study of geological characteristics, Preliminary control of the mineralization, testing geophysical and geochemical anomalies | Global control of ore body; describe the deposit model; testing geophysical and geochemical anomalies | Detailed control of ore body; establish the deposit model. |
| Sample space | Very few samples | Limited samples | Systematic sampling | Systematic dense sampling |
| Continuity | | Inferred | Basic | Confirmed |
| Geological confidence | Predicted Resource (334) ? | Inferred Resource (333) | Indicated Resource (332) | Measured resource (331) |
| Metallurgical test | | Analogy , separability test | Analogy , separability test ,laboratory processing test, enlarge test. | laboratory processing test, enlarge test, semi-commercial test, if necessary. |
| Feasibility study | | Preliminary Study | Preliminary Study is required, the estimate mineral resources is used for pre-feasibility study. | Preliminary study is required, , the estimate mineral resources is used for feasibility study. |

| The Existing Mineral Resource/Reserve Classification System of China | | | | | | |
|--|-------------|-------------|-------------|----------|--------------|---|
| | | Discovered | | | Undiscovered | |
| | | Measured | Indicated | Inferred | Predicted | |
| Economic | Fea- | 111 111b | | | | <ul style="list-style-type: none"> Reserve Basic Reserve Marginally Basic Reserve Sub-Economic Resource Intrinsic Resource Predicted Resource |
| | Pre- | 121 121b | 122 122b | | | |
| Marginally Economic | | 2M11 | | | | |
| | | 2M21 | 2M22 | | | |
| Sub-Economic | | 2S11 | | | | |
| | | 2S21 | 2S22 | | | |
| Intrinsic Economic | | 331 | 332 | 333 | 334? | |

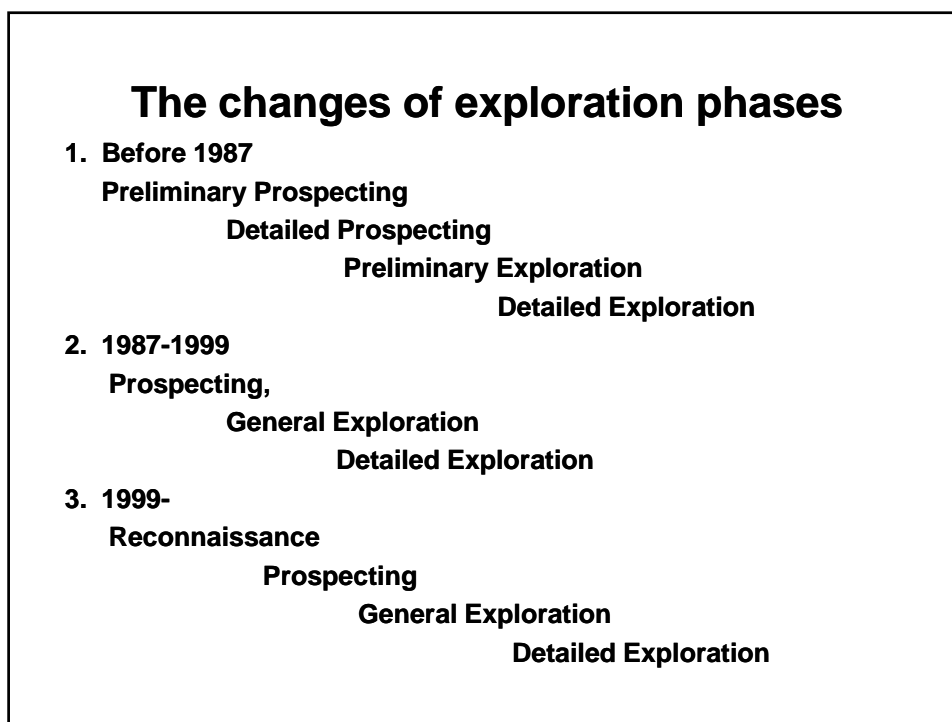
Fea-: feasibility study Pre-: pre-feasibility study



There are three levels of studies corresponding to the three major exploration phases:

- 1. Preliminary study: a investment opportunity study, based on geographic location, characteristics of the mineralization, market situation and other factors.**
- 2. Pre-feasibility study: in general, carried out by mine design institutions based on guideline developed by the institutions.**
- 3. Feasibility study: in general, carried out by mine design institutions based on guideline developed by the institutions.**

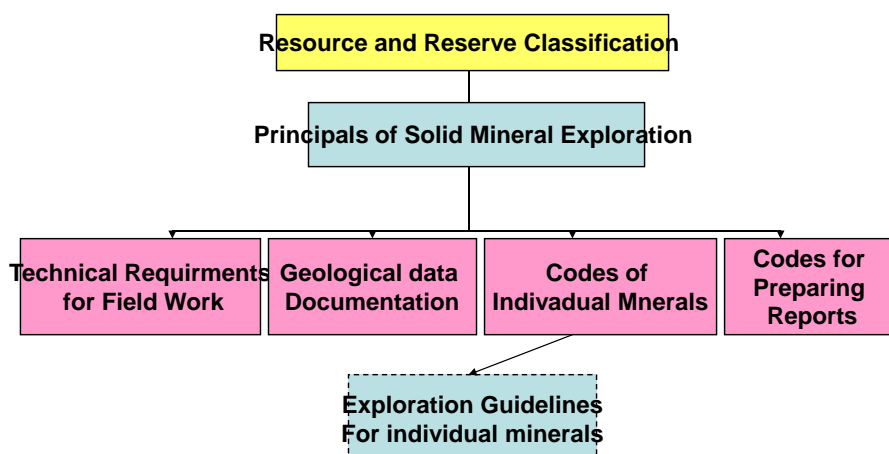
| 不同时期资源储量分类类型、级别对比 | | | | | | | |
|--------------------------|---------------------------|---------|------|--------|------|--------|------|
| 1954-1999年 资源储量 分类 | 分类 | 分 级 | | | | | |
| | 固体矿产储量分类 1954n | 探 明 储 量 | | | | | |
| | | 平衡表内 | A1 | A2 | B | C1 | C2 |
| | | 平衡表外 | A1 | A2 | B | C1 | C2 |
| | 矿产储量分类暂行规范(总则) 1959n | 探 明 储 量 | | | | | |
| | | 开采储量 | 设计储量 | | | 远景储量 | 地质储量 |
| | | 平衡表内 | A1 | A2 | B | C1 | C2 |
| | 金属、非金属矿床地质勘探规范总则 1977n | 探 明 储 量 | | | | | |
| | | 能利用储量 | A | B | C | D | |
| | | 暂不能利用 | A | B | C | D | |
| 固体矿产地质勘探规范总则 1992n | | 能利用储量 | a | A | B | C1 | D |
| | | b | A | B | C1 | D | E |
| | 尚难利用 | A | B | C1 | D | E | |
| 现行 资源储量 分类 | 固体矿产资源/储量分类 1999n | 资源储量类型 | | 查明矿产资源 | | 潜在矿产资源 | |
| | | 经济意义 | 经济的 | 探明的 | 控制的 | 推断的 | 预测的 |
| | | | | 111 | | | |
| | | 经济的 | 111b | | | | |
| | | | 121 | 122 | | | |
| | | 经济的 | 121b | 122b | | | |
| | | | 2M11 | | | | |
| | | 边际经济的 | 2M21 | 2M21 | | | |
| | | | 2S11 | | | | |
| | | 次边际经济的 | 2S21 | 2S22 | | | |
| 内蕴经济的 | 331 | | 332 | 333 | 334? | | |



Series of Standards

Since early 50's of the 20 century, China began to develop standards for mineral exploration by referring to the Soviet Union's standards. The efforts to make China standards were from 1959 by the State Commission of Mineral Reserves (SCMR) . After 1983, SCMR issued standards concerning mineral resource and reserve classification, principals of mineral exploration, exploration codes of individual minerals. In the last ten years, the committee of standardization of the ministry was authorized to approve such standards . The state standards shall be issued by General Administration of Quality Supervision, Inspection and Quarantine . The trade standards shall be issued by the ministry. Sofar, the series of standards were revised five times. The China Geological Survey issued some standards .

Series of Standards



Series of Mineral resource and Reserve classification

**Solid Mineral Resource/Reserve classification
GB/T17766-1999**

**Petroleum Resource/Reserve Classification
GB/T19492-2004**

**Coal Bed Gas
Mineral Resource/Reserve Classification
DZ/T0216-2002**

**Principals of Codes of Solid Mineral Exploration
GB/T13908-2002**

**Classification Standards for underground Water
GB 15218-94**

**Principals of Codes of Solid Mineral Exploration includes the
following contents:**

Scope

Reference to standards

The goal of mineral exploration project :
**reconnaissance, prospecting, general
exploration, detailed exploration.**

**The exploration work : the contents of exploration, control
requirements, requirements for exploration phases,
requirements for exploration quality.**

**Faesibility studies : Preliminary study, pre-feasibility study,
easibility study.**

**Mineral Resource/Reserve Classification : factors,
conditions and creteria of classification.**

**Mineral Resource/Reserve estimation : cut off,general
principals of estimation , selection of estimation methods.**

**For each exploration codes of individual minerals, includes requirements
for exploration phases.**

Series of Codes for Field Work

- **Code for geological logging of mineral exploration**
- **Code for exploration data and information documentation**
- **Code for survey**
- **Code for drilling**
- **Code for tunnelling**
- **Code for core management**
- **Code for exploration of hydrogeology and engineering geology of mineral deposit**
- **Code for sampling**
- **guidelines for selecting cut-off of thickness, grade and other quality parameters of ore deposits**
- **Code for geophysical and geochemical survey**

The existing exploration codes for individual or group minerals

- **Coal, peat coal (DZ/T0215-2002)**
- **Uranium (DZ/T0199-2002)**
- **iron, manganese, chromium (DZ/T0200-2002)**
- **copper, lead, zinc, silver, nickel, molybdenum
(DZ/T0214-2002)**
- **tungsten, tin, mercury, antimony (DZ/T0201-2002)**
- **rock gold (DZ/T0205-2002)**
- **bauxite, magnesite) (DZ/T0202-2002)**
- **Pyrite (DZ/T0210-2002)**
- **Phosphate (DZ/T0209-2002)**
- **Placer (metal) (DZ/T0208-2002)**

- **Rare Earth (DZ/T0204-2002)**
- **Rare Metal (DZ/T0203-2002)**
- **barite, witherite, fluorspar, boron (DZ/T0211-2002)**
- **metallurgical and chemical limestone (DZ/T0213-2002)**
- **kaolin, bentonite, refractory clay (DZ/T0206-2002)**
- **salts and lake salts (DZ/T0212-2002)**
- **silicon material for glass, decorative stone, gipsy (DZ/T0207-2002)**
- **gypsum, chrysotile, wollastonite, talc, graphite(DZ/T0207-2002)**
- Code of resource/reserve reporting for mine shut
- Regulations for ore processing test

In 80-90's of 20 century, The series of codes for mineral reserve classification issued by the State Committee of Mineral Reserves include deposit types, case studies which are useful and helpful for exploration geologists to conduct their exploration work.

Case studies include deposit type, mineralization characteristics, ore processing nature, cut off of grade, drill hole distribution, conclusion. A case study provides geological map, section map, comparison between exploration and mining reserves.

Evaluation for Mineral Resource/Reserve Report

Since 1950's of the last century, The State Committee of Mineral Reserves was responsible for evaluating and supervising mineral reserve reports. There was a branch of the central committee in each province, responsible for evaluating and supervising mineral reserve reports in the province. This reserve evaluation and supervision system took a role to guarantee the quality of mineral reserve reports.

With the ever bettering of market economy in China, the governmental controlled reserve evaluation and supervision system is not suitable for exploration and mining practice. A new consulting evaluation system replaced the old system. Now there are about 20 reserve evaluation centers throughout China. Any evaluation of Mineral resource or reserve report should follow the evaluation procedures and regulations. If a report passed by evaluation, it is permitted to provide this report for governmental, technical or commercial use.

Mine development

The procedure of mine development in China includes four stages :

- Earlier stage of construction
 - preparation
 - in the process of construction, completion
 - check and accept.

If a mineral resource or reserve report is qualified by evaluation, then it can be submitted, with relevant materials to mineral resources administration for applying mining license.

If some significant changes of mineral resources or reserves arise during the mine development or production, the resource or reserves should be re-estimated and submit the report for evaluation.

If a mine is going to shut down, the remaining resource or reserves should be estimated and submit the report for evaluation.

Technical Requirements and Guidelines for Feasibility study and Mine Design

**Codes, regulations ,guidelines handbooks for feasibility study
and mine design are developed by mine design institutes.**

Taking nonferrous metal industry as an example, a set of standards
can be listed as follows:

- Outline of report compilation for preliminary feasibility study
- The principal regulations in contents and depth of feasibility study for nonferrous metal enterprises
- The principal regulations in contents and depth of feasibility study report compilation for nonferrous metal enterprises
- The principal regulations in contents and depth of preliminary mine design for nonferrous metal enterprises
- Handbook for mining engineers

Thank you !