



生态环境部核与辐射安全中心

Nuclear and Radiation Safety Center



Preliminary analysis of the results of NORMs in the second China Pollution Sources Census

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1. Introduction



2. Survey Objectives and Objects



3. Initial Measurement and Detailed Investigation



4. Pilot Projects



5. Quality Assurance



6. Expectation of Survey Results

1.Introduction

Census basis

- ◆ Regulations on China Pollution Sources Census. (Order No. 508 of the state council).
- ◆ China Pollution Sources Census is conducted every 10 years. The first census was completed between 2007 and 2009.
- ◆ The second China Pollution Sources Census will be conducted from 2017 to 2019.
- ◆ **Acompanying radioactive mines** are the only radioactive objects in this census.

1.Introduction

The first China Pollution Sources Census

Accompanying radioactive mines:

Rare earth、 Niobium/tantalum、 Zircon /Zirconia、 Tin、 Lead/Zinc、 Copper、 Iron、 Vanadium、 Phosphate、 Coal、 Aluminum. All 11 kinds of mineral resources;

Mining; smelting and processing of radioactive pollution source.

- ◆ More than 11000 enterprises was surveyed.
- ◆ Determined 1433 objects which meet the requirements of technical regulations census.
- ◆ Mastered the basic situation of NORMs.



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The preparation of technical program

Program for the Second National Survey of Pollution Sources

Technical Provisions for the Accompanying Radioactive Mines

国务院办公厅文件

国办发〔2017〕82号

国务院办公厅关于印发 第二次全国污染源普查方案的通知

各省、自治区、直辖市人民政府，国务院各部委、各直属机构：
《第二次全国污染源普查方案》已经国务院同意，现印发给你们，请认真组织实施。



2017年9月18日

(此件公开发布)

国务院第二次全国污染源普查 领导小组办公室文件

国污普〔2018〕1号

关于印发《第二次全国污染源普查 伴生放射性矿普查监测技术规定》的通知

各省、自治区、直辖市第二次全国污染源普查领导小组办公室，环境保护部核与辐射安全中心，环境保护部各地区核与辐射安全监管站：

为贯彻落实《国务院关于开展第二次全国污染源普查的通知》（国发〔2016〕59号）和《国务院办公厅关于印发第二次全国污染源普查方案的通知》（国办发〔2017〕82号）精神，做好第二次全国污染源普查伴生放射性矿普查工作，现将《第二次全国污染源普查伴生放射性矿普查监测技术规定》印发给你们，请

2. Survey Objectives and Objects

The purpose of survey

The type and distribution of minerals

The level of radioactivity of minerals

The quantity of accomonyng radioactive solid waste

The discharge of effluent

Set up database



Radiation environmental management

2. Survey Objectives and Objects



Survey Objectives

Numb	Mineral species	Category of enterprises and survey objects
1	Rare earth	<p>Mining: raw ore and waste rock; Dressing: tailings, concentrate and discharge of waste water; Smelting and separation: slag and waste water</p>
2	Niobium/ tantalum	<p>Mining: raw ore and waste rock; Dressing: tailings, concentrate and discharge of waste water; Smelting and separation: slag and waste water</p>
3	Zircon /Zirconia	<p>Mining and separation: raw ore and waste residue; Zircon produces zirconium oxide and zirconium metal; Produce zirconia waste residue and discharge waste water by chemical method</p>
4	Tin	<p>Mining: raw ore, waste rock and waste water discharge; Beneficiation and smelting: tailings and waste water from industry</p>

2. Survey Objectives and Objects

Numb	Mineral species	Category of enterprises and survey objects
5	Lead/Zinc	<p>Mining: raw ore and waste rock ;</p> <p>Dressing: tailings, concentrate and discharge of waste water ;</p> <p>Smelting: slag and waste water discharge</p>
6	Copper	<p>Mining: raw ore and waste rock ;</p> <p>Flotation, biological leaching (heap leaching) : tailings, residues and waste water;</p> <p>Smelting and electrolysis: slag and slag.</p>
7	Iron	<p>Mining: raw ore and waste rock ;</p> <p>Dressing: tailings, concentrates and waste water discharge;</p> <p>Smelting: iron slag, blast furnace slag and steel slag; The bottom ash of a melting furnace</p>
8	Vanadium	<p>Mining: raw ore and waste rock ;</p> <p>Dressing: tailings, concentrates and waste water discharge;</p> <p>Smelting: vanadium slag, smelting slag; The bottom ash of a melting furnace.</p>

2. Survey Objectives and Objects



Numb	Mineral species	Category of enterprises and survey objects
9	Phosphate	Mining: raw ore and waste rock; wet production: phosphogypsum and discharge of wastewater; Phosphate heat treatment: slag
10	Coal	Solid waste residue and waste water produced in the development and utilization of coal mine (coal gangue); Solid waste residue and waste water produced in the process of exploitation and utilization of stone coal
11	Aluminum	Mining: raw ore and waste rock; Smelting: red mud and effluent discharge.

2. Survey Objectives and Objects



Numb	Mineral species	Category of enterprises and survey objects
12	Molybdenum	Mining: raw ore and waste rock; Dressing: tailings, concentrates and waste water discharge; Smelting: solid waste residue and discharge of waste water
13	Nickel	Mining: raw ore and waste rock; Dressing: tailings, concentrate and discharge of waste water Smelting: solid waste residue and discharge of waste water
14	Germanium/ Titanium	Mining: raw ore and waste rock; Dressing: tailings, concentrate and discharge of waste water; Smelting: solid waste residue and discharge of waste water
15	Gold	Mining: raw ore and waste rock; Dressing: tailings, concentrate and discharge of waste water; Smelting: solid waste residue and discharge of waste water



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3. Initial Measurement and Detailed Investigation



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3. Initial Measurement and Detailed Investigation

Establish a directory

National Bureau of
Statistics

State Administration for
Industry and Commerce
P.R.C

**Preliminary survey list of
accompanying radioactive
mines**

Ministry of Natural
Resources of P.R.C

State Taxation
Administration or grid
company

3. Initial Measurement and Detailed Investigation

Initial Measurement:

The enterprises in the list must be monitored on the spot as required, and the detailed objects must be selected according to the monitoring results.

Technology Route:

Route 1: Gamma dose rate at 1m surface of solid material was monitored on site beyond "local background level "+150nGy/h".

Route 2: Solid samples were sampled and analyzed, and the activity concentration of any nuclide in U and Th systems was larger than 0.3Bq/g.

If the initial test results meet one of the above conditions, a detailed investigation must be processed.

3. Initial Measurement and Detailed Investigation

1. Adopt the mode of patrol measurement;
2. Select the monitoring points according to the survey results



3. Select representative sampling points, collect solid samples;
4. Bring them back to the laboratory for analysis.

3. Initial Measurement and Detailed Investigation

Detailed Investigation: Monitoring radionuclides

According to the initial measurement, the enterprises which above the screening level are sampled and investigated.

According to the contents of the census forms, the detailed results are used as the basis for the census monitoring data.

γ radiation air
absorbed dose
rate

Waste water

raw material

Solid waste

Total U

U-238

U-238

Total Th

Ra-226

Ra-226

Ra-226

Th-232

Th-232

Total α

Total β

3. Initial Measurement and Detailed Investigation



3. Initial Measurement and Detailed Investigation

Detailed Investigation

- The amount of mineral products mined or smelting raw materials
- The quantity and destination of waste water
- Main types, storage mode, holding amount and annual production volume of solid waste containing radionuclides



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4. Pilot Projects

- ✓ We selected four provinces Shanxi, Hunan, Sichuan and Guizhou to conduct the pilot survey of accompanying radioactive mines. The pilot project was carried out from the whole process of investigation, including program formulation, directory establishment, field monitoring, laboratory analysis, quality assurance, report filling, data processing, summary and report compilation

◆ Conclusion

1. The technical route of initial measurement is verified.
A total of 560 enterprises were initially tested and screened according to the two technical routes at the same time. Among 395 enterprises that failed to meet the screening standards both according to route 1 and route 2.

4. Pilot Projects

2. The validity of measuring Th-232 with spectrometer is verified.

The total thorium was analyzed for the waste residue samples whose radioactive balance might be destroyed.

- ❑ Using spectrometer to detect Th-232 of 25 samples;
- ❑ Comparing the results of chemical methods;
- ❑ The absolute relative deviation: 0.1%~30.6%;
- ❑ 24 samples of the test results is within 10%, only one sample is in 30.6%.

Notes: *The spectrometer to determine the results of the sample has been close to the minimum detectable limit of the spectrometer method, so the measuring results is larger than actual results.*

Considering the spectrometer by determining the results of Th-232 and the method of chemical analysis. There is no significant difference. The result is consistent.



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5. Quality Assurance

- ① **In the preparation phase:** Comparison and correction of radioactive monitoring instruments
- ② **Monitor process :** In the process of pilot census, preliminary survey and detailed investigation. The quality assurance must be carried out by means of supervision, inspection and sampling monitoring.
- ③ **Census data :** Select a certain proportion of census objects, conduct quality random check on unit filling rate, filling condition of main indicators of census form, and check the census data.



1. Introduction



2. Survey Objectives and Objects



3. Initial Measurement and Detailed Investigation



4. Pilot Projects



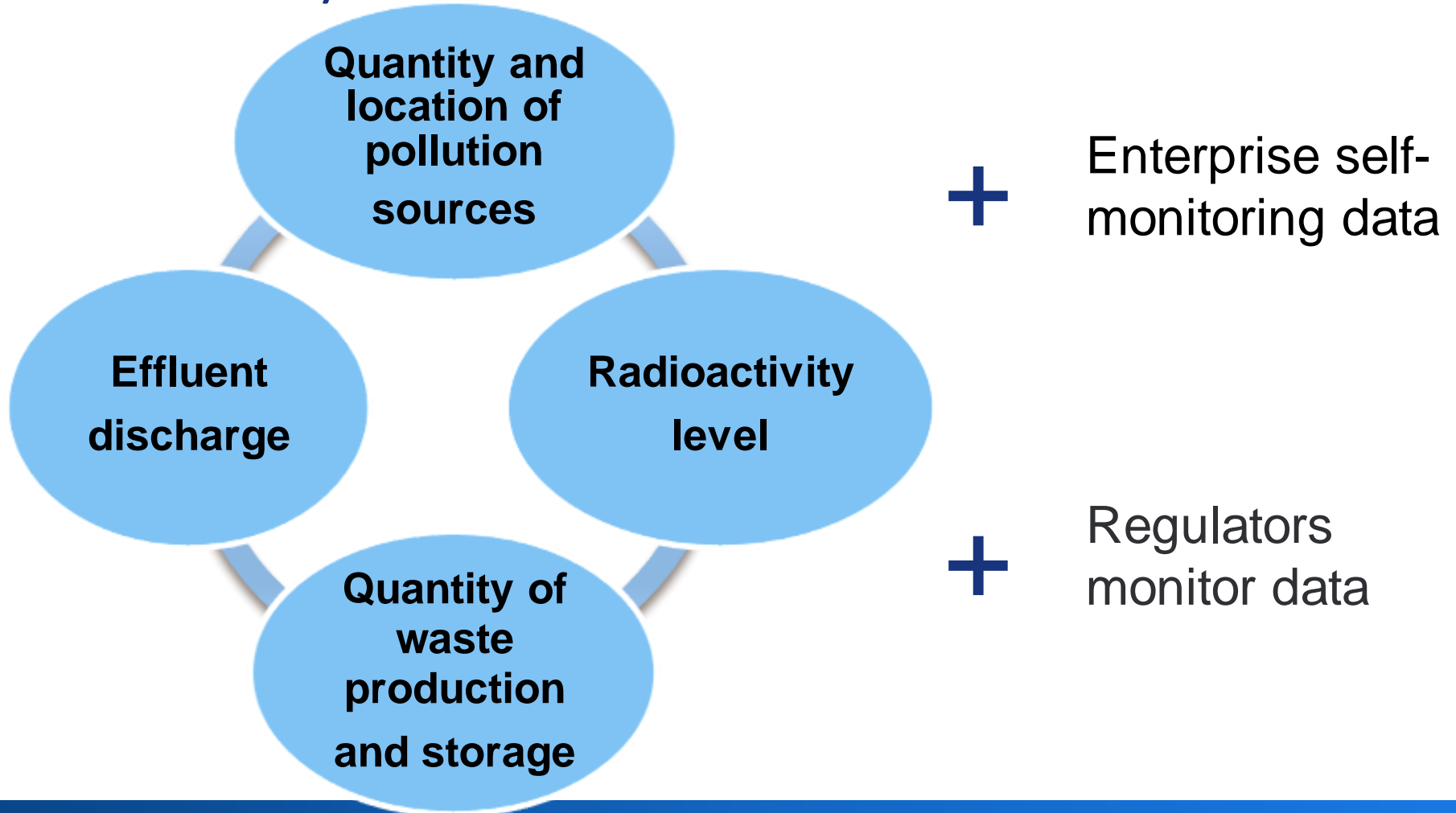
5. Quality Assurance



6. Expectation of Survey Results

6. Expectation of Survey Results

1. Build Survey Database



6. Expectation of Survey Results

2. One Picture Display Platform





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Thanks

