Soil Contamination Countermeasures

Soil Environment Management Division

Environmental Management Bureau

Ministry of the Environment

Government of Japan

General description of the Soil Contamination Countermeasures Law※ (1)

※ Proclamation in May 2002; Enforcement in February 2003

Target chemical substances

(designated hazardous substances)

(1) Health effects due to direct ingestion of contaminated soil
e.g. heavy metals which accumulate in large concentrations in the surface horizon over long periods

(2) Health effects due to water contamination
a soil leachate standard based on the ingestion of groundwater.

Mechanism

Investigation

・When specified facilities using hazardous substances are discontinued

・When a regulatory authority encounter the possibility of adverse health effects from soil contamination

↓

Investigation and reports

By landowner, site management

By designated research institution

↓

Designated Areas

(When standards for the registered districts are not met)

↓

Designated and announced by regulatory authorities and registered on the list of designated areas for public disclosure

↓

General description of Soil Contamination Countermeasures Law※ (2)

※ Proclamation in May 2002; Enforcement in February 2003

Management of designated areas

Control of land character changes
- Notification to regulatory authority about character change of land in designated areas
- If inappropriate, regulatory authority direct applicants to redraft plans

When regulatory authority encounter the possibility of adverse health effects from soil contamination

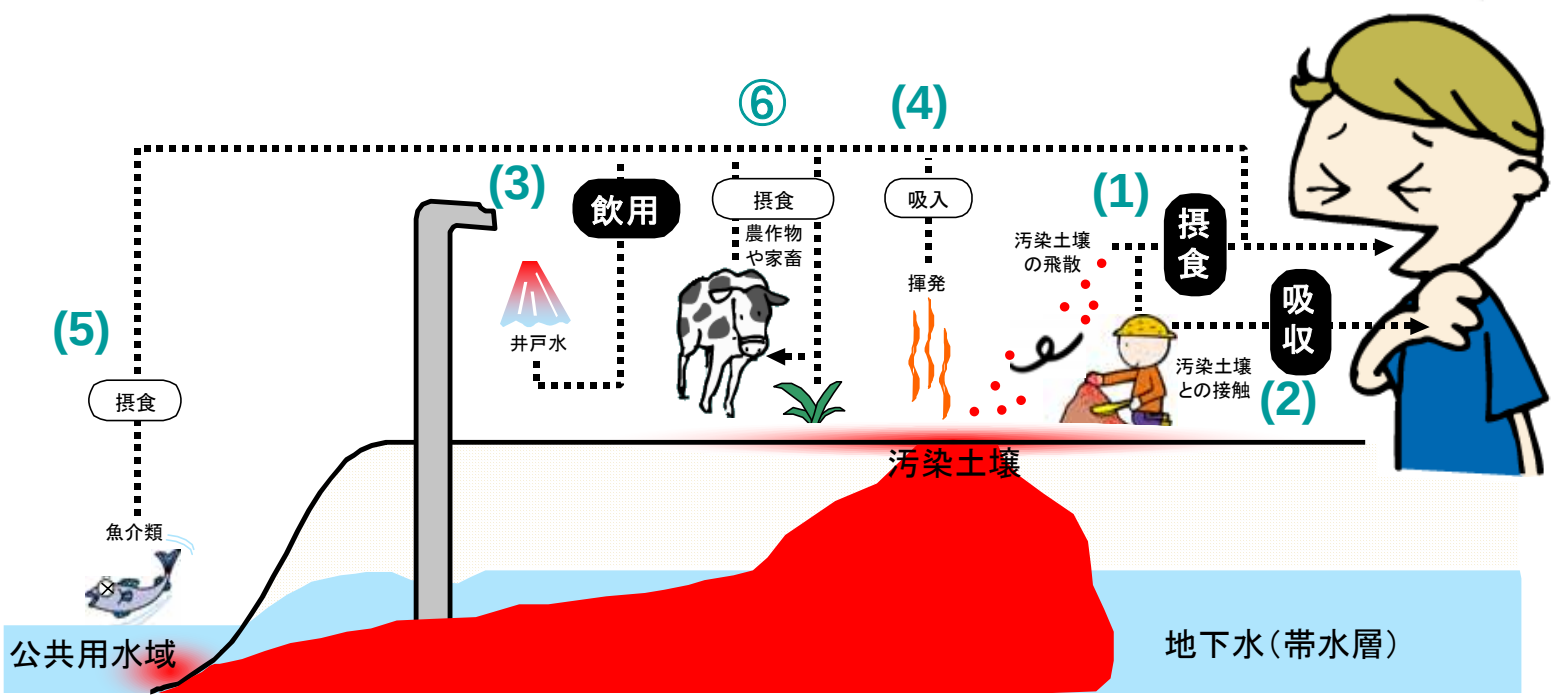
Contamination remediation measures

regulatory authority direct the polluter* in the execution of contamination remediation.
- Measures to prevent direct ingestion: (1) area restrictions, (2) concrete capping, (3) fill, (4) replacement of soil, (5) treatment of contaminated soil
- Measures for prevent ingestion of groundwater: (1) groundwater quality control, (2) immobilization of contaminant to groundwater, (3) barriers, (4) remediation of contaminated soil

* Or if the polluter cannot be identified, the landowner should remediate the site with support from the authorities.

Designated areas are de-registered, when remediation is completed

How soil contamination creates health risks



1. Direct ingestion of contaminated soil (including soil particulate)
2. Dermal absorption
3. Ingestion of groundwater contaminated by hazardous substances eluted from contaminated soil
4. Inhalation of hazardous substances emitted from contaminated soil to atmosphere
5. Discharge of soil containing hazardous substances to municipal waterways → accumulation in aquatic ecology → ingestion by human beings
6. Accumulation of hazardous substances in crops and livestock raised on contaminated land → ingestion by human beings

Classes of designated hazardous substances

Class 1

Designated hazardous substances

(VOC)

- carbon tetrachloride
- 1,2 - dichloroethane
- 1,1-dichloroethylene
- cis-1,2-dichloroethylene
- 1,3-dichloropropene
- dichloromethane
- tetrachloroethylene
- 1,1,1-trichloroethane
- 1,1,2-trichloroethane
- trichloroethylene
- benzene

Class 2

Designated hazardous substances

(Heavy metals etc.)

- cadmium and compounds
- hexavalent chromium and compounds
- cyanide and compounds
- total mercury and compounds
- selenium and compounds
- lead and compounds
- arsenic and compounds
- fluorine and compounds
- boron and compounds

Risk for direct ingestion (9 items)

Class 3

Designated hazardous substances

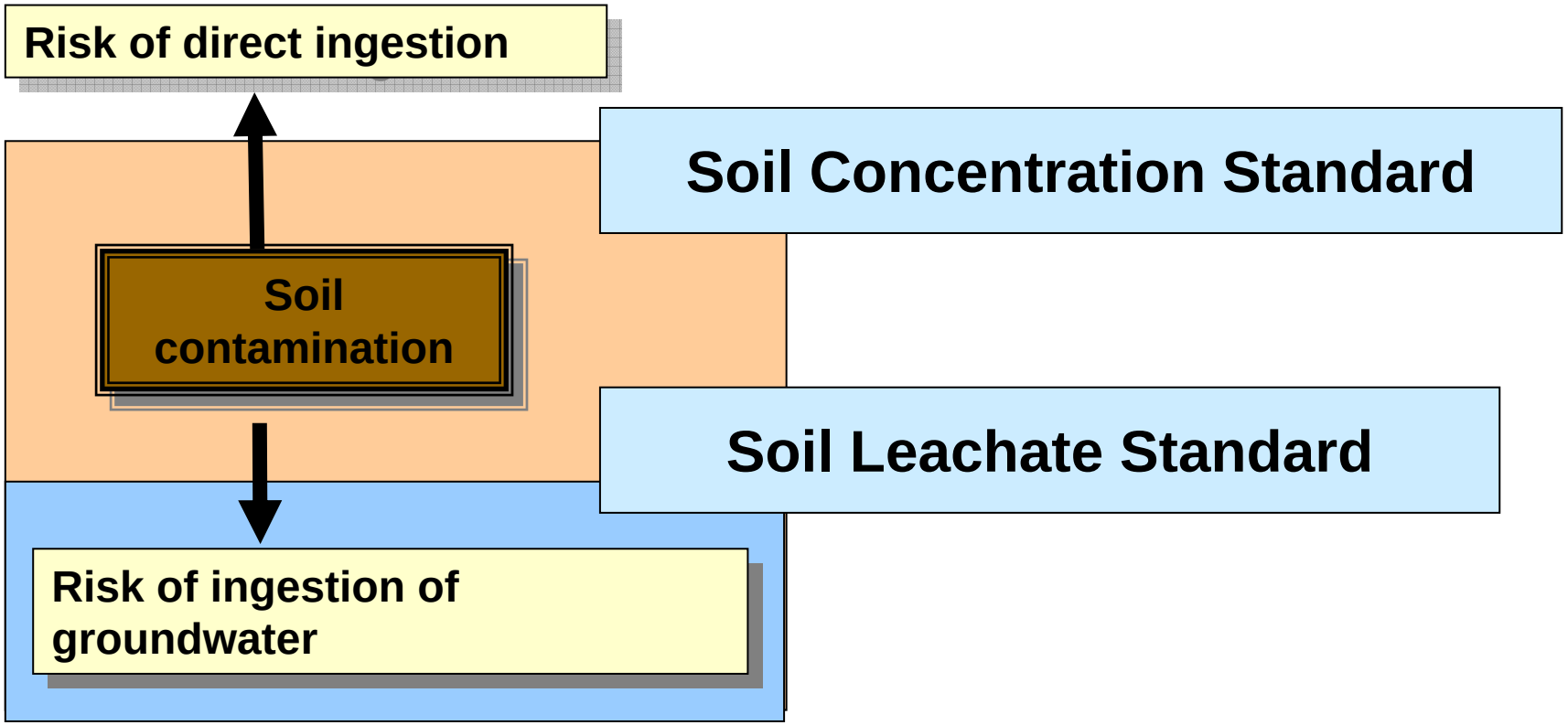
(Agrichemicals, PCB..)

- simazine
- thiram
- thiobencarb
- PCB
- organic phosphorus compounds

Risk for ingestion through groundwater etc. (25 items)

Designation Standard

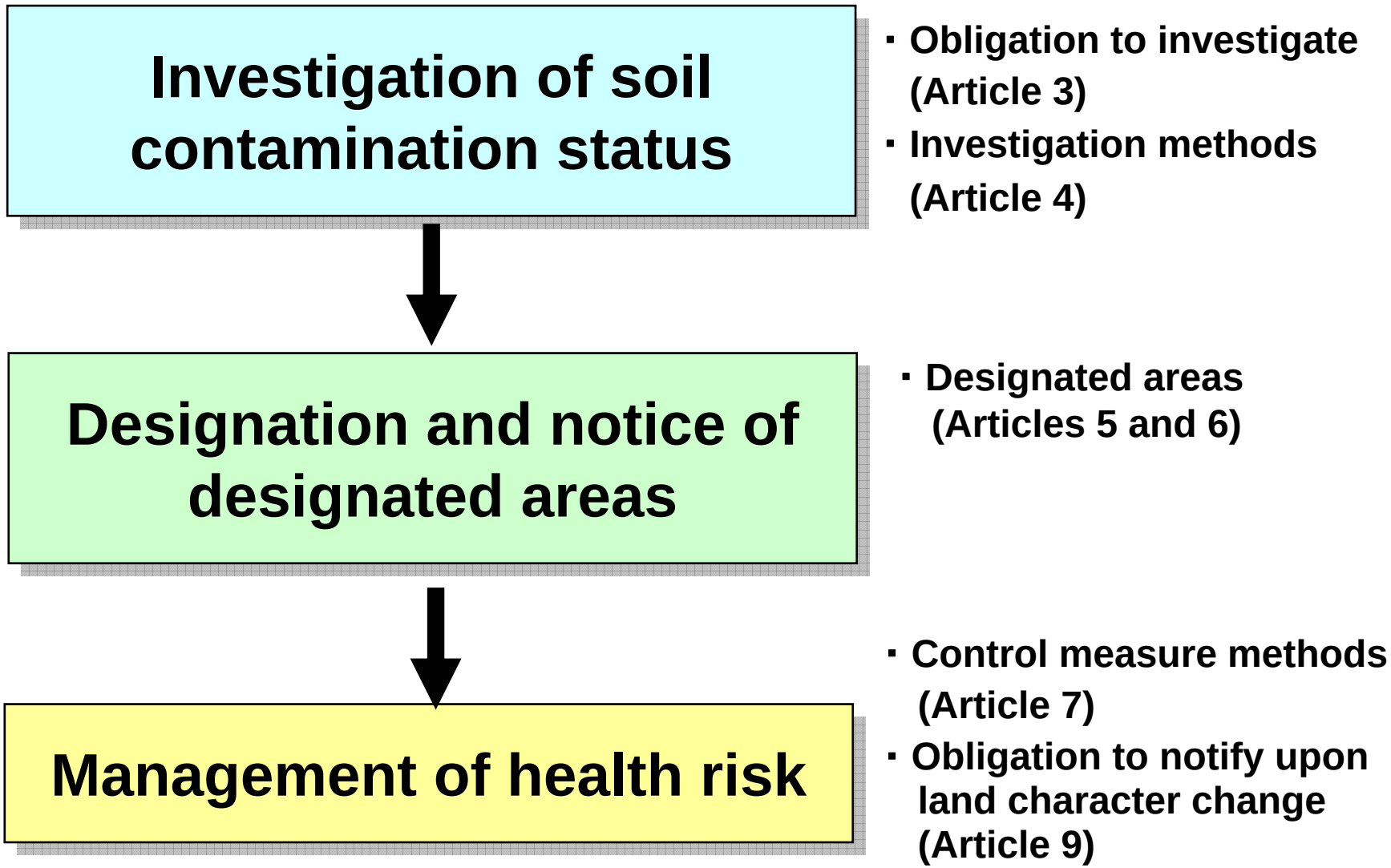
Soil is assessed as contaminated if it exceeds the standard.



Target substances and standards

Designated hazardous substances（Article 2 of the Law）		Designation standard（Article 5 of the Law）		Reference: Soil Environment Standard（except for copper）
		Soil Concentration Standard ＜Risk for direct ingestion＞	Soil Leachate Standard ＜Risk of ingestion from groundwater etc.＞	
Carbon Tetrachloride	Class 1 (VOC)		≤ 0.002mg / L	≤ 0.002mg / L
1，2－Dichloroethane			≤ 0.004mg / L	≤ 0.004mg / L
1，1－Dichloroethylene			≤ 0.02mg / L	≤ 0.02mg / L
cis－1，2－Dichloroethylene			≤ 0.04mg / L	≤ 0.04mg / L
1，3－Dichloropropene			≤ 0.002mg / L	≤ 0.002mg / L
Dichloromethane			≤ 0.02mg / L	≤ 0.02mg / L
Tetrachloroethylene			≤ 0.01mg / L	≤ 0.01mg / L
1，1，1－Trichloroethane			≤ 1mg / L	≤ 1mg / L
1，1，2－Trichloroethane			≤ 0.006mg / L	≤ 0.006mg / L
Trichloroethylene			≤ 0.03mg / L	≤ 0.03mg / L
Benzene			≤ 0.01mg / L	≤ 0.01mg / L
Cadmium and its compound	Class 2 (Heavy metal etc.)	≤ 150mg / kg	≤ 0.01mg / L	≤ 0.01mg / L, and ≤ 1mg / 1kg rice on agricultural field
Hexavalent Chromium compounds		≤ 250mg / kg	≤ 0.05mg / L	≤ 0.05mg / L
Cyanides compounds		As isolated cyanides ≤ 50mg / kg	Less than detection limit	Less than detection limit
Total Mercury and its compounds		≤ 15mg / kg	≤ 0.0005mg / L	≤ 0.0005mg / L
Alkyl Mercury			Less than detection limit	Less than detection limit
Selenium and its compounds		≤ 150mg / kg	≤ 0.01mg / L	≤ 0.01mg / L
Lead and its compounds		≤ 150mg / kg	≤ 0.01mg / L	≤ 0.01mg / L
Arsenic and its compounds		≤ 150mg / kg	≤ 0.01mg / L	≤ 0.01mg / L and ≤ 15mg / kg soil on rice field
Fluorine and its compounds		≤ 4000mg / kg	≤ 0.8mg / L	≤ 0.8mg / L
Boron and its compounds		≤ 4000mg / kg	≤ 1mg / L	≤ 1mg / L
Simazine	Class 3 (Agrochemicals and PCBs)		≤ 0.003mg / L	≤ 0.003mg / L
Thiuram			≤ 0.006mg / L	≤ 0.006mg / L
Thiobencarb			≤ 0.02mg / L	≤ 0.02mg / L
PCB			Less than detection limit	Less than detection limit
Organic phosphorus compounds			Less than detection limit	Less than detection limit

Mechanisms of the Soil Contamination Control Law



Enforcement situation of the Soil Contamination Countermeasures Law

■Article 3 related （As of August 31, 2006）

- ・De-registration of specified facilities 2，631
- ・Reporting of Soil Investigation Results 511
- ・On-going Soil Investigation 59
- ・Deferred Soil Investigation by regulatory authority 2，027
- ・Under consideration of deferral for Soil Investigation 70
- ・Others 85

（cases being considered by authorities whether investigations should be conducted or deferred）

■**Article 4 related**（As of December 31, 2006）

- ・No. of cases where investigations were ordered 4

■**Article 5 related**（As of December 31, 2006）

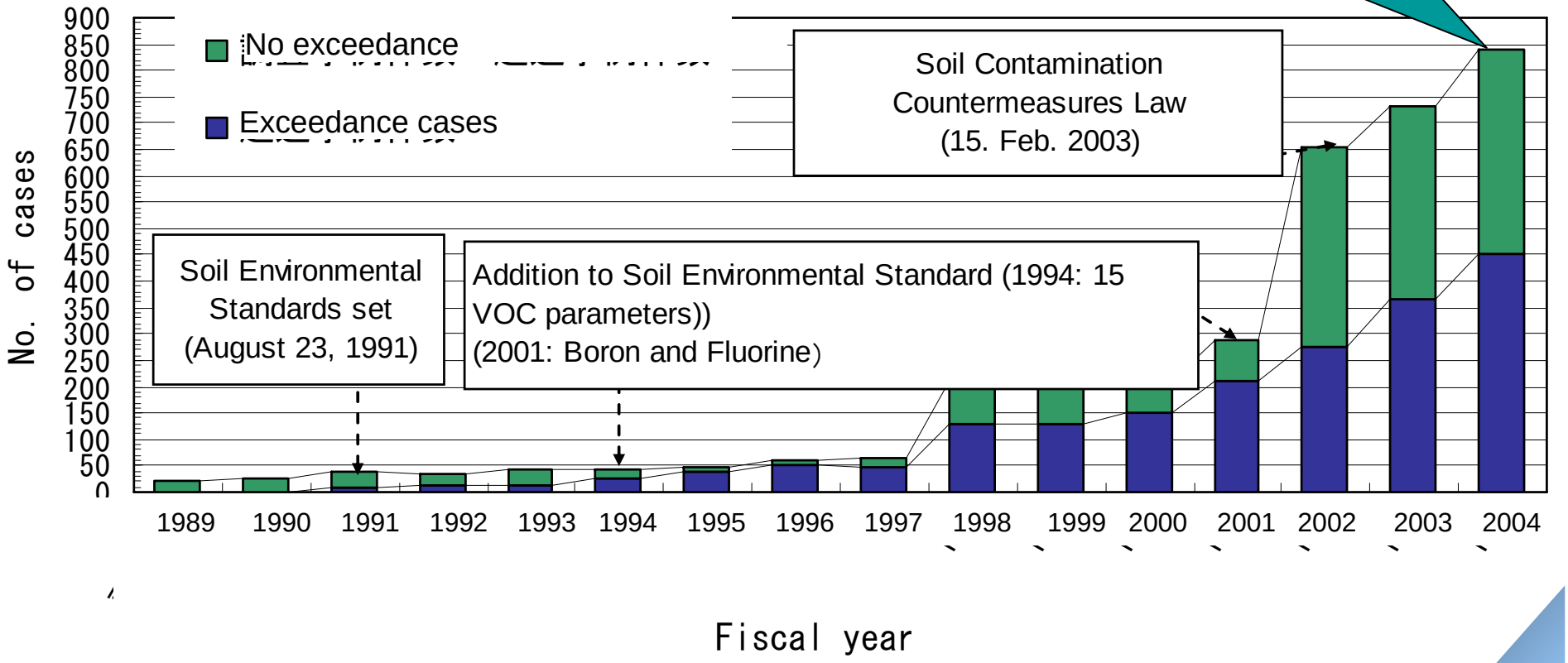
- ・No. of sites registered as a designated area due to exceedance of designated standards 161

（of which Article 3 related：159 , and article 4 related ：2）
（Remediation measures conducted at 70 of the 161 designated areas, and have been de-registered.）

Cases of Soil Contamination per fiscal year

For fiscal year 2004

Total investigation cases: 838
Exceedance of standards: 454



Soil contamination Investigations

1. Obligation of investigations for land-owners and others (Article 3)

When specified facilities produce, use or treat designated hazardous substances are abandoned, the landowner, owner or site management is obliged to commission designated investigation companies investigate soil contamination of manufacturing/operating areas where the specified facilities were previously located and the results reported to the prefectural governors.

Paragraph 1, Article 3 states:

Regulatory authority can allow the delay of investigations for cases where:

(1) Continued use and management of a site where unauthorised access is controlled

(2) Continued use of a site with unchanged operational conditions

(3) Small-scale factories (where factory owners reside within or adjacent to the premises)

(4) Mines in operation

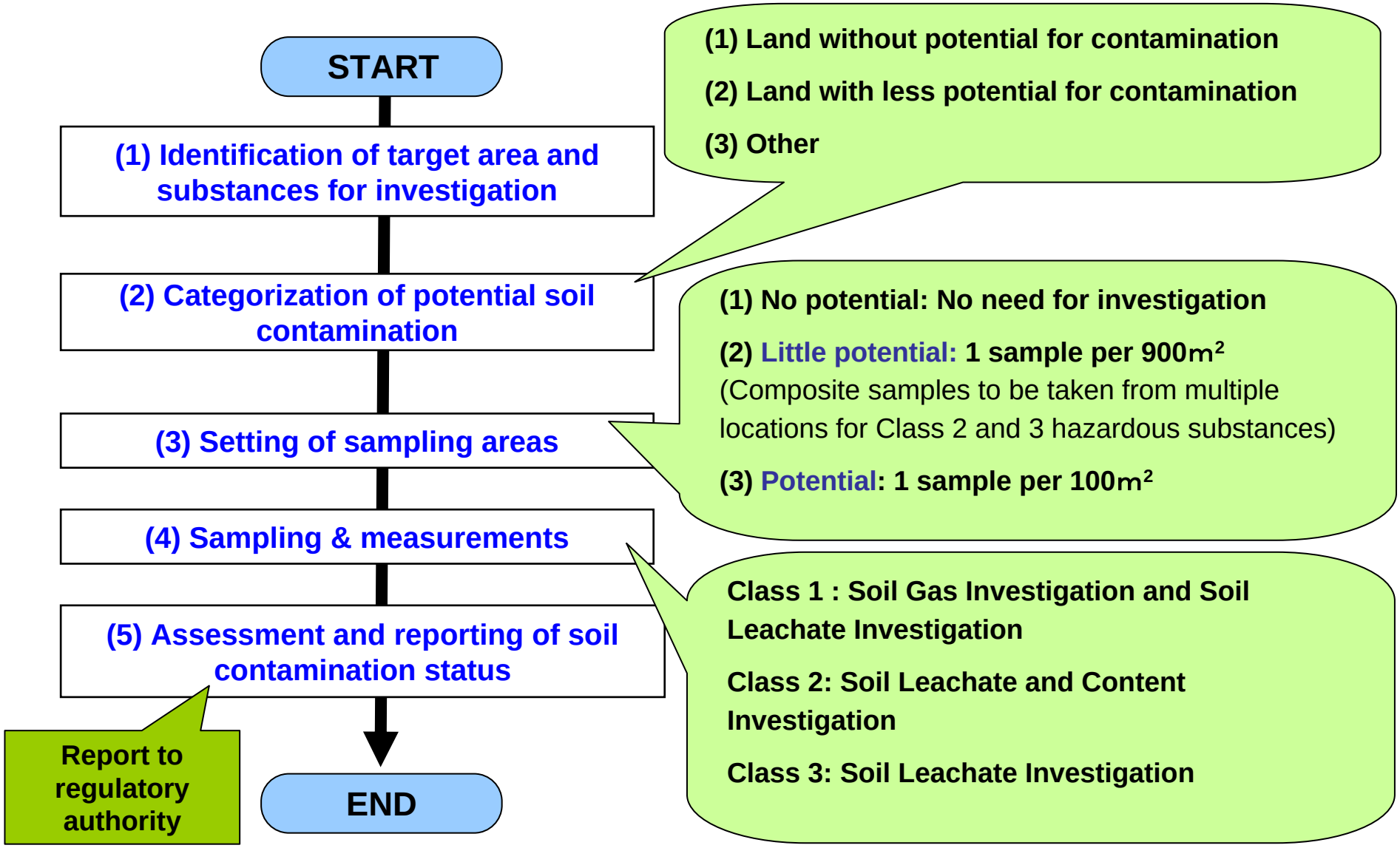
2. Direction by regulatory authorities to conduct a soil contamination investigations (Article 4)

(1) Governors and others can direct land-owners and other parties to investigate and report on the soil contamination conditions when encountering concerns of adverse health hazards caused by soil contamination

(1) When groundwater contamination is identified and where it is used as drinking water in the surrounding area

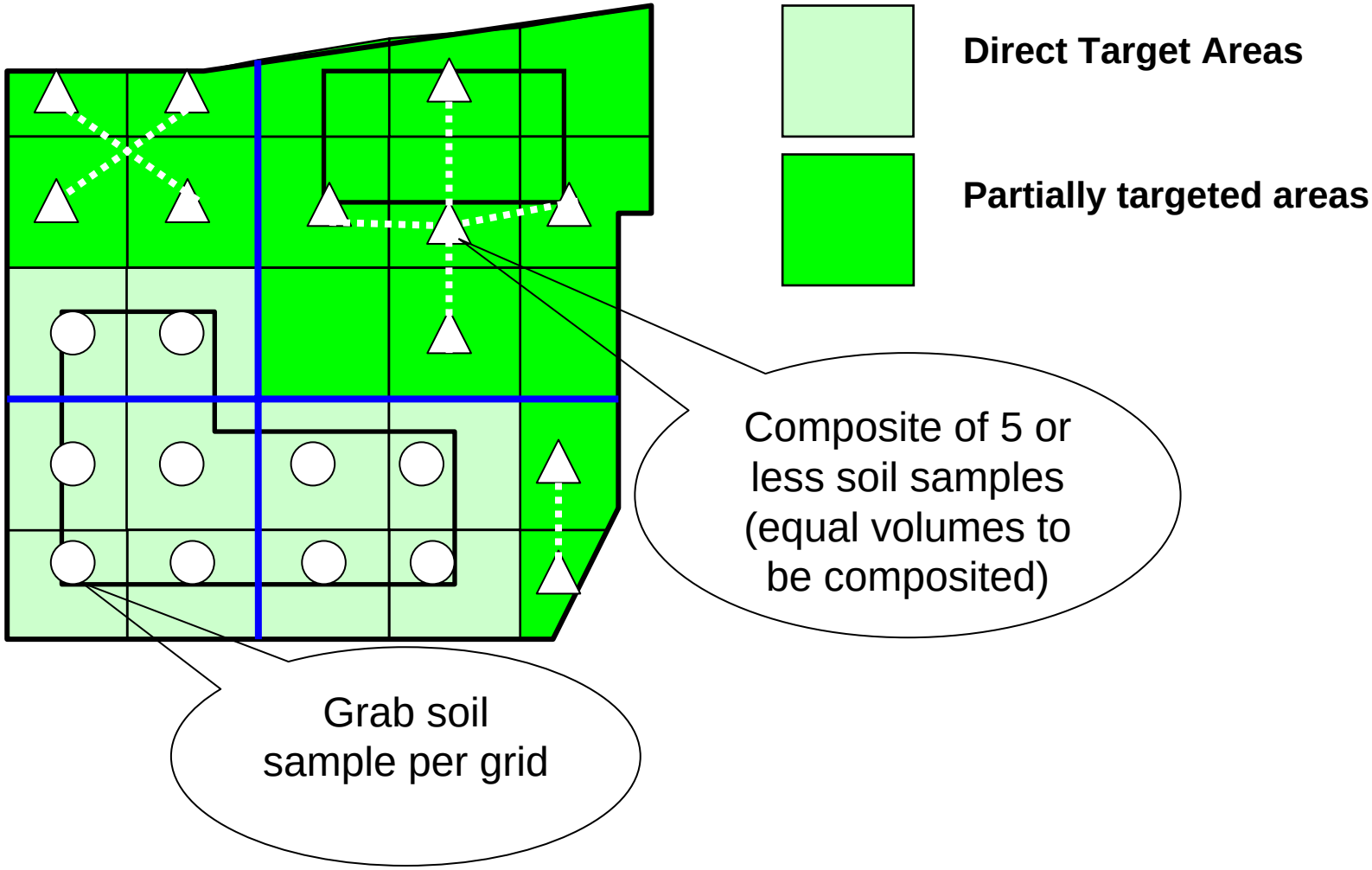
(2) When a land parcel is considered to be a potential contaminated site which is accessible to the general public

Process of status survey on soil contamination

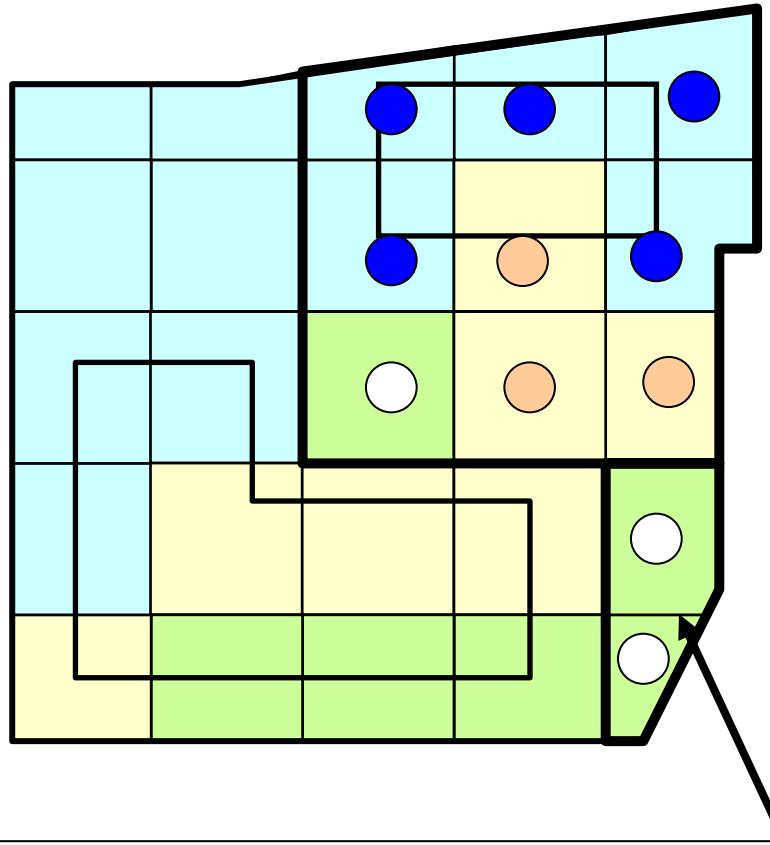


Identification of contamination (Sampling Grids)

Example of Class 2 Designated Hazardous Substances Investigation Methodology



Identification of contamination (Result of investigation)



Compliant with standards

Exceedance of standards

Omission of sampling etc

Uncontaminated grid

Contaminated grid

Grid deemed to be contaminated

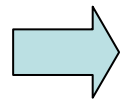
Omission of individual grid analyses (deem that the composite sample result is representative of the two grids).

3. Designated Areas (Article 5)

- Land which does not meet the **designation standard** based on the results of a soil contamination investigation (Article 3 or 4)
  → Designation and announcement of areas as contaminated by designated hazardous substances
  → Registration on the list of designated areas
  → Restriction to land character changes
  → Implementation of measures such as contamination remediation

(1) Registration of designated areas

- Ingestion of groundwater
  → leachate standard (leachate to solution)
- Direct ingestion of contaminated soil
  → concentration standard (analyzed by HCl extraction (standard molar concentration specified))



The area becomes designated if one of the standards is exceeded.

(2) De-registration of designated areas

- When the reason for designation is no longer applicable due to removal or remediation of contaminated soil
  → De-registration of the entire or part of the designated area and its notice
- Measures such as **capping, filling, or containment of contaminated soil** to prevent its ingestion by human beings
  → Restriction of land character changes as a designated area

4. Measures for Designated Areas (Article 7)

- Designated areas, where the potential of contaminated soil ingestion or indirection ingestion via groundwater exists.
- Land without on-going groundwater contamination is targeted for investigation, if the surrounding groundwater is used as drinking water (even if groundwater impacts are still not identified).
- land is not applicable if contamination remediation measures have already been undertaken.

(1) Individuals targeted for Remediation Orders

- **Polluter**.

  If it is deemed appropriate to order the polluter to conduct remedial measures, and agreed by the landowner agrees.
- **The landowner** if the polluter is unknown.

(2) Contamination causing activities targeted by Article 7

- Activities which bury, disperse, discharge or inject into groundwater, designated hazardous substances or materials that contain the designated hazardous substances in the liquid or solid form.

(3) Description of remediation measures

- Prevention of contaminated soil direct ingestion

  (1) access limitations
  (2) surface capping
  (3) filling
  (4) replacement of soil; and
  (5) treatment of contaminated soil

- Prevention of groundwater ingestion etc.

  (1) groundwater monitoring

  (2) immobilization of contaminant to groundwater

  (3) barriers; and
  (4) remediation of contaminated soil

Land character change in designated areas

- If substances exceed contamination standards within a designated area
  → Prevention of risk by **changing land character**

(examples of risk)

- contaminated soil exposure through excavation
- contamination of groundwater through contaminated soil being in contact with an aquifer
- reuse of excavated contaminated soil for fill

Restriction of land character change

- Notification required at least 14 days in advance, if the land character is to be changed within designated areas.
- If the planed methods do not comply with the regulatory standards stipulated by the Ministry of Environment, authorities must require the redrafting of the plan.

Removal of contaminated soil from designated areas

- Procurement of appropriate transportation of contaminated soil
  → contaminated soil strictly covered by waste manifests
- Procurement of appropriate treatment
  → final waste disposal sites etc, and disposal facilities authorised by prefectural governors and others

Description of essential items of Law on Real-estate Trade and Building lots

Restriction of buildings, and building lots according to the regulations

Notification of land character change within designated areas according to the Soil Contamination Control Law

Law on real estate trade and building lots (Article 35, paragraph 1)

Important considerations for disclosure of contamination to concerned parties in real estate transactions.

Designated investigation companies

Investigation companies are registered with the Environment Minister for **soil contamination investigations,** (1669 institutions registered, as of Jan. 2007)

→ This system defines that only designated investigation companies can undertaken soil contamination investigations as the findings affects the registration of designated areas, and the **selection of contamination remediation measures**, and therefore the investigations should be reliable.

Guidelines on the Control of Oil Contamination

Property owners considerations for the control of oil odor and floating oil films caused by oil contaminated soil - March, 2006

1. **Objective: reference for land-owners to resolve oil contamination issues*.**
2. **Composition and general description**
   - **Chapter 1: basic considerations of control measures**
   - **Chapter 2 (basic): for land-owners without basic or technical knowledge.**
   - **Chapter 2 (specific): for operators of investigations and remediation**

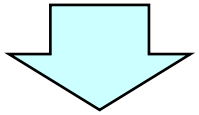
* Oil odor or floating oil film resulting from oil contaminated soil causes issues for individuals using or planning to use sites where land comprises soil, ponds, groundwater, well-water, or other water media contaminated with oil.

3. **Basic considerations for remediation**

   - **Basic remediation measures for oil contamination to eliminate discomfort / unpleasantness caused by oil odors or floating oil films.**
   - **Basic definition of oil odors and floating oil films perceivable to humans.**
   - **TPH concentrations are used to address levels perceivable to humans and to establish a common understanding of the individuals and parties affected.**

Countermeasures for Lead-containing Contamination on Rifle Ranges

Recently, lead-containing contamination on rifle ranges has been considered with regard to soil elution and water contamination in the surroundings of rifle ranges. Control measures have been taken on some rifle ranges.



However, no unified method of investigations / remediation is yet established.

Guidelines on the investigation and control measures for rifle range sites is necessary, if use of rifle ranges is to continue.

Guidelines established within FY2006

Development and promotion of lower cost investigation techniques

1. Evaluation of remediation techniques for contaminated soil

Background

- High cost and time-consuming investigations and control measures
- Excess burden for medium, small and micro-sized enterprise polluters

Issues

- Necessity for the development and promotion of practical methods for lower cost remediation

Controls

- MoE's adoption of public subscription methods for investigation and control measures and associated technique evaluations

Affects

Technique evaluation results are posted on the web for;
- Promotion of use of best techniques
- Facilitation for investigations and control measures for soil contamination

(1) Surveys on techniques of investigation and control measures on low cost
http://www.env.go.jp/water/dojo/gijyutsu/index.html
(2) Surveys on remediation techniques for soil contaminated by dioxin
http://www.env.go.jp/water/dojo/diox-tech/index.html

Promotion of remediation of contaminated soil

Background

- Rapid increase of voluntary investigations and remediation of contaminated soil in recent years due to the trend of urban redevelopment and merger & acquisitions.
- Concerns regarding the adequacy of investigation and remediation methods. (Contamination exacerbation through contaminated soil excavation).

Main subject:
Procurement of excavated soil disposal

Consideration of remediation for brown-field sites

Background and issues

- Number of cases of soil investigations and remediation has increased recently.
- Concerns of brown-field abandonment without investigation/remediation is rising.

Brownfield sites abandonment without preferable land use

Causes

Problems

Actions

Understand the practical problems and issues regarding brown-field sites by hearing from individuals/parties engaging in real estate transactions, city redevelopment, real estate businesses, trust banks and real estate appraisers.

Establishment of investigative commission consisting of academic experts

Brownfield Programs in Japan
～How to deal with Brownfield sites～

System for remediation of soil contamination based on the "Dioxin Special Measures Law"

Proclamation 1999

Areas with standard exceedances
(public access possible)

Designated areas
(Designation of control measures for dioxin-related soil contamination; Article 29, prefectural governors)

Procedure for prefectural governors
- Hearings with Environment Council etc.
- Hearings with municipal mayors

Establishment of plans
(Establishment of remediation plans for dioxin-related soil contamination; Article 29, prefectural governors)

Procedure for prefectural governors
- Hearings with municipal mayors
- Public hearings
- Agreement with the Environment Minister

Continued Monitoring

Article 26 (prefectural governors)

Remediation
(i.e. removal of contaminated soil)

Subsidies from the Ministry of Environment

Cost burden estimation
(Law on Operator's responsibility for Cost of Contamination Prevention)
Operator's responsibility applicable if causality is scientifically clear.

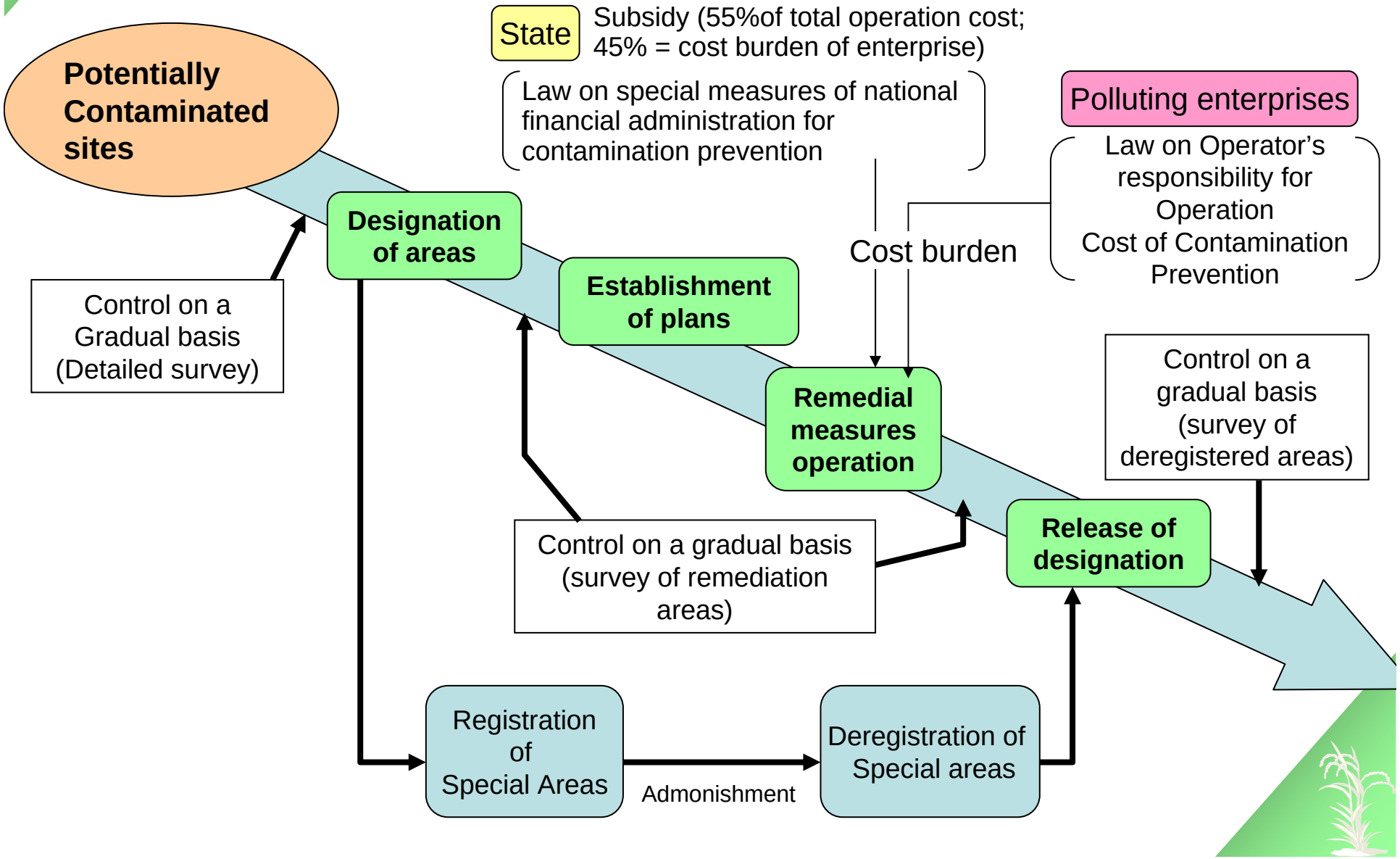
Bank raising of grant rate
(Law on special measures of national financial administration for contamination prevention)

De-registration of designation
(De-registration under the Dioxin Special Measures Law; Article 30, prefectural governors)

Procedure for prefectural Governors
- Hearings with the Environment Council etc.
- Hearings with municipal mayors

Outline of Law on Soil Contamination Prevention in Farmland

Proclamation in 1970



Contamination Prevention Law for Farmland