

Environmental Protection of Soil and Groundwater in Taiwan

2021 Country Report

Achievement

- Cleanup 128 hectares of listed farmland. Achieve year goal and resume agricultural usage.
- Accumulatively cleanup 1,184 hectares of polluted farmland.
- Achieve original goal of finishing remediation by 2021.
- Revise regulation to manage underground and above-ground storage tanks together.
- Strengthen installation of pollution prevention facilities and monitoring devices, and regularly monitor the underground environment from 2023.
- Promote installation of solar photovoltaic (PV) facilities on contaminated land.
- Facilitate partnership between landowners and PV builders.
- Achieve multi-win goals of diversified land use, green energy generation and sustainable environmental management.
- Owners of 63.34 hectares (319 lots) farmland are willing to participate, of which owners of 19 hectares (92 lots) applied for installation.

Promote Verification System for Soil and Groundwater Remediation Technology

- Step 1: Technology certification of finishing remediation
Merit: Provide actual performance certification and platform to help industry matchmaking.
Achievement: 7 remediation sites have been approved, and 14 control sites are under review.
- Step 2: Technology certification of effective remediation
Merit: Highlight the technologies that are able to accelerate remediation.
Goal: Establish review and management system in 2022.
- Step 3: Environmental Technology Verification
Merit: Lower barriers to enter into international market through international recognition.
Goal: Assist third-party verification organizations in 2022.

Expand Industry-Academy Cooperation and Technology Application

- In 2021, 47 projects have been funded for research and development
- Completed 9 rounds of remediation, forensics and high-resolution site characterization technology application tests

- Completed 170 international journal submissions
- Obtained 23 patents and facilitated 5 technology transfers
- Created 8.3 million USD/year industrial value and created 255~384 job opportunities

World Soil Day (December 5th)

Topic in 2021: Halt soil salinization, boost soil productivity.

Taiwan EPA prepared daily quizzes on Facebook from December 1st to 5th, 2021. Those who answered correctly could get GreenPoints, and could then redeem the points for goods in convenience stores.

Development and future needs of soil and groundwater remediation industry in KOREA

Revision of Soil Environment Conservation Act (Dioxin standard)

It is needed to set a soil standard of Dioxin for systematic soil investigation and appropriate treatment following observed soils with dioxin in the returned US military bases in Korea.

※ In addition to dioxine there are 22 regulatory soil contaminants on concern standards and countermeasure standards in Korea.

As results of animal experiment, dioxins are the first grade cause cancer material and toxic material with immunotoxicity, carcinogenic, cardiac dysfunction, accumulation and recalcitrance, etc.. Dioxin is danger because it is non-degradable, accumulated in organism and not excreted.

Dioxin is appointed as a regulatory soil contaminant to establish pre-management foundation in November, 2018.

Even though appointed as regulatory soil contaminant, social expenses have been occurred because the standard is not ready yet. Therefore, it is needed to set standards by area.

It plans to set soil standard by area following review for status of overseas standards and baseline study for soils contaminated with dioxin in Korea.(December 2021).

| contaminant | Concern Standard* | | | Countermeasure Standard | | |
|---|-------------------|--------|--------|-------------------------|--------|--------|
| | Area 1** | Area 2 | Area 3 | Area 1 | Area 2 | Area 3 |
| Dioxin (including furan) (pg-TEQ/g) | 160 | 340 | 1,000 | 500 | 1,000 | 3,000 |

* Difference of regulatory control and administration order according to exceeded standards

** Classification with Area 1 to 3 according to use purpose and characteristics of land.

Commemoration of World Soil Day in Korea

World Soil Day designated by UN is commemorated and MOE has held annually to announce importance of soils which is basis of ecosystem to nation in Korea.

7th celebration was held on 3 December, 2021 since commemoration of World Soil Year in 2015.

The commemoration consists of programs including special performance, commemorative lecture, experience booth, etc. and operates art contests including essay, etc. and SNS (instagram, facebook, ect.) event, etc. for funny and beneficial commemoration to nation.

In addition, run side events including a seminar that soil and groundwater experts attend, etc. Side event was skipped in 2021 commemoration due to COVID-19 and ran online commemoration. (YouTube live).

A question to the Working Group

Please inform standard and management of current regulatory soil and groundwater contaminants, and future management plan of emerging contaminants (eg, PFAS, etc.) on your country.

Country Report - New Zealand

Kia Ora Tatau

There is a lot of change in New Zealand that will affect how contaminated land and groundwater will be assessed and managed in the future. We are at the various stages of change in many of the pieces of legislation that are in some way associated to contaminated land.

Legislative Change

The New Zealand Government plans to repeal the Resource Management Act and enact new laws to create a resource management system that will safeguard the wellbeing of current and future generations. The proposed reform of the resource management system will see a package of legislation enacted including the Natural and Built Environments Act (NBA), the Strategic Planning Act (SPA) and a response to climate change.

Natural and Built Environments Act (NBA)

The proposed Natural and Built Environments Act is the main replacement for the Resource Management Act (1991). It's all about enabling development within environmental limits.

The NBA and secondary regulations will detail how contaminated land and groundwater are addressed and by whom.

Strategic Planning Act (SPA)

The proposed Strategic Planning Act (SPA) is one of the pieces of legislation the Government intends to enact to reform the resource management system and safeguard the wellbeing of future generations.

The SPA will identify areas of land that are suitable and unsuitable for development based on the quality and appropriateness of the land

Waste legislation and strategy under development

To transform our waste system, we are developing a new national waste strategy and new legislation to better regulate how we manage products and materials circulating in our economy.

The Government is also proposing new and more comprehensive legislation on waste to replace the Waste Minimisation Act 2008 and the Litter Act 1979. The Government is also proposing new and more comprehensive legislation on waste to replace the Waste Minimisation Act 2008 and the Litter Act 1979. New legislation will create the tools to deliver the waste strategy and ensure we make good use of funds generated by the expanded waste disposal levy. It will also reset the purposes, governance arrangements, and roles and responsibilities in legislation. and strengthen and clarify regulatory and enforcement powers.

The national waste strategy presents our proposed vision and aspirations for a low-waste Aotearoa, and how we plan to get there. It will guide and direct our collective journey toward a circular economy. The strategy sets out course to 2050. The first stage to 2030 includes proposed priority areas, headline actions, and specific targets to help assess our progress reducing waste and making better use of resources.

A provision for addressing historical waste issues is being considered as part of the Waste Minimisation Act review.

Climate change programme

Cabinet has agreed a framework for the whole of Government, which will drive our climate change policy towards low greenhouse gas emissions (emissions) and climate resilience in New Zealand. The national climate change risk assessment will be regularly prepared to improve understanding and prioritisation of the climate change risks that New Zealand faces. The national adaptation plan will outline the Government's planned approach to addressing risks highlighted in the national climate change risk assessment.

One of the priority risks identified in the national climate change risk assessment was contaminated sites, and in particular landfills that are vulnerable to the effects of climate change especially flooding and coastal erosion and inundation.

Contaminated land guidance documents

In June 2021, the Ministry published two revised contaminated land management guidelines

Contaminated land management guidelines No. 1: Reporting on contaminated sites in New Zealand (Revised 2021)

This guideline provides guidance for reporting on contaminated land investigations in New Zealand. It has been developed to ensure consistency in reporting on contaminated site investigations. It includes checklists for reporting requirements for contaminated sites and for the removal of petroleum underground storage tanks.

Contaminated land management guidelines No. 5: Site investigation and analysis of soils (Revised 2021)

This guideline serves as a good practice guide for planning and carrying out investigations on sites where hazardous substances are present or suspected. It also provides guidance on the principles governing the interpretation of the data obtained and for developing a robust conceptual site model.

Country Report - Thailand

Chayawee Wangcharoenrung
Pollution Control Department, Thailand

The main regulation for soil and groundwater pollution in Thailand is effective since 2016 it is called Ministry of Industry Decree on Soil and Groundwater Contamination Control within Factory Area B.E. 2559 (2016). This article summarize mechanism under this regulation.

National Environmental Committee's resolution on 2010 entrusted Ministry of Industry with cooperation from Ministry of Natural Resource and Environment to develop control measures for soil and groundwater contamination in industrial area. Department of Industrial Works began a study on drafting a regulation in 2011 and submit a draft Ministry of Industry Decree on Soil and Groundwater Contamination Control within Factory Area for consideration of the cabinet and get approval in 2013. After approval, the regulation was edited by task force set up by Office of Council of the State with help from Department of Public Health, Pollution Control Department, Office of Natural Resource Policy and Planning, and Department of Industrial Works during 2014 – 2015. Revision was finished on October 2015 and was sent to cabinet for another approval (because of significant changes was made) before sign by Minister of Industry and published on April 29th 2016 and effective since October 2016. Principles of the decree are followed,

- 1) Given definition for soil and groundwater contaminant as “volatile organic compounds (VOCs), heavy metals, pesticide and insecticide, any substance specified in MOI decree on disposal of waste or unused material and other substances specified by government”.
- 2) Business owner must collect soil and groundwater sample within factory area and manage that the contamination found is not exceeding level specified in soil and groundwater contamination criteria.
- 3) Newly operated factory must collect soil and groundwater samples within factory area and compile a monitoring report as background level before operation and collect soil and groundwater sample on second time within 180 days after begin operation and must submit a report to Department of Industrial Works within 120 days after due date of second time inspection.
- 4) Existing factory must collect sample in its area for the first time within 180 days after this regulation become effective, must compile a monitoring report within 180 days after the due date of first time monitoring and must collect sample on second time within 180 days after the first inspection and must submit a report within 120 days after due date of second time inspection.
- 5) All factory must continue soil sampling in every 3 years and groundwater sampling every year and must submit an inspection report to Department of Industrial Works within 120 days after due date of each inspection case, in the long term.
- 6) When contamination result exceeding level specified, factory owner must propose contamination control measure and contamination reduction measure and report to Department of Industrial Works within 180 days after problem has been found. In such case, owner must propose a time frame for problem fixing.
- 7) Target type of factory shown in table below,

| Type | Type of Activities | Size |
|-------------|---|-------------|
| 22 | Textile yarn or fiber industry | Category 3 |
| 38 | Pulp or paper industry | All Size |
| 42 | Chemical industry | All Size |
| 45 | Paints industry | All Size |
| 48 | Chemical related product industry | All Size |
| 49 | Petroleum refinery industry | All Size |
| 60 | Non-ferrous Metal Basic industries | All Size |
| 74 | Electrical equipment industry | Category 3 |
| 100 | Product finishing industry (painting, plating, anodizing) | All Size |
| 101 | Central Waste Treatment Plant | All Size |
| 105 | Waste sorting and landfill | All Size |
| 106 | Waste recycling industry | All Size |

- 8) The report must be submitted to either Department of Industrial Works or Provincial Industrial Office depending on location of factory
- 9) Under this regulation, Ministry of Industry Notification on Contamination limit, Inspection Criteria and Monitoring Report of Soil and Groundwater within Factory area B.E. 2559 (2016) was also announced. The notification set up an acceptable level of soil and groundwater contamination level in factory area. Some 126 parameters are specified from Acenaphthene to Zinc.

Although some 6 years has passed since this regulation become effective, the government is still struggle with soil and groundwater sample. The main reason is that not all laboratory can analyze parameters as specified in the Notification.

Thailand is still lacking on consultant that can do good investigation and effective remediation. Many of remediation projects are still using such conventional technology such as pump and treat and hydraulic control.

Activities of GEPC and Regulatory Measures against Groundwater Pollution and Soil Contamination in Japan

December 17, 2021

Teruyoshi HAYAMIZU

Vice Chair

Geo-Environmental Protection Center (GEPC), Japan

(Note) Materials for this presentation are prepared by the speaker and GEPC, or based on those provided from MOE Japan and modified by the speaker as appropriate.

Contents

1. Activities of Geo-Environmental Protection Center (GEPC)
2. Measures against groundwater pollution
3. Measures against soil contamination



一般社団法人
土壤環境センター

Geo-Environmental Protection Center

1. Activities of Geo-Environmental Protection Center (GEPC)

About GEPC

The **Geo-Environmental Protection Center** of Japan (GEPC) was established in April 1996 to promote remediation of contaminated soil and groundwater and contribute to protecting human health and conserving the living environment. The GEPC is Japan's sole non-government public service corporation involved in the issue of soil and groundwater contamination.

Activities of GEPC

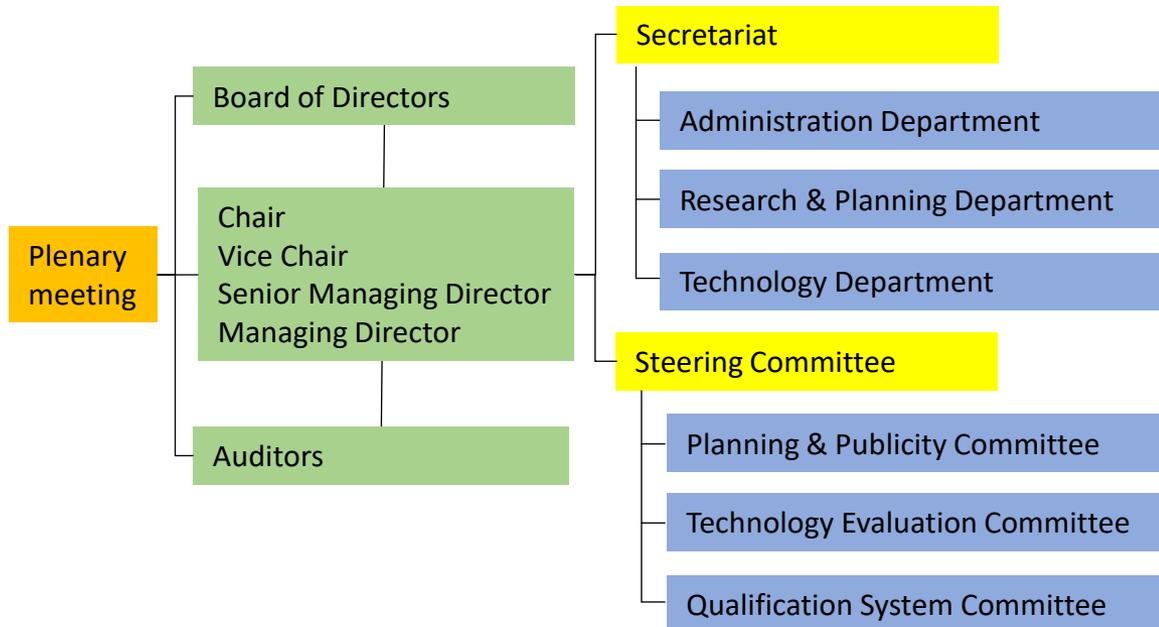
1. Improves Investigation & Countermeasure Techniques and Evaluation & Control Methods

2. Performs Study and Research in Japan and Overseas

3. Conducts Awareness-Raising and PR Activities

4. Implements a Qualification System

Organization of GEPC



Member companies of GEPC

A total of 100 companies are member of GEPC. The main industries of the member companies are Civil Engineering and Construction, Consulting Service, Investigation and Analysis, and Processing. They are leading companies in soil and groundwater contamination control in Japan.

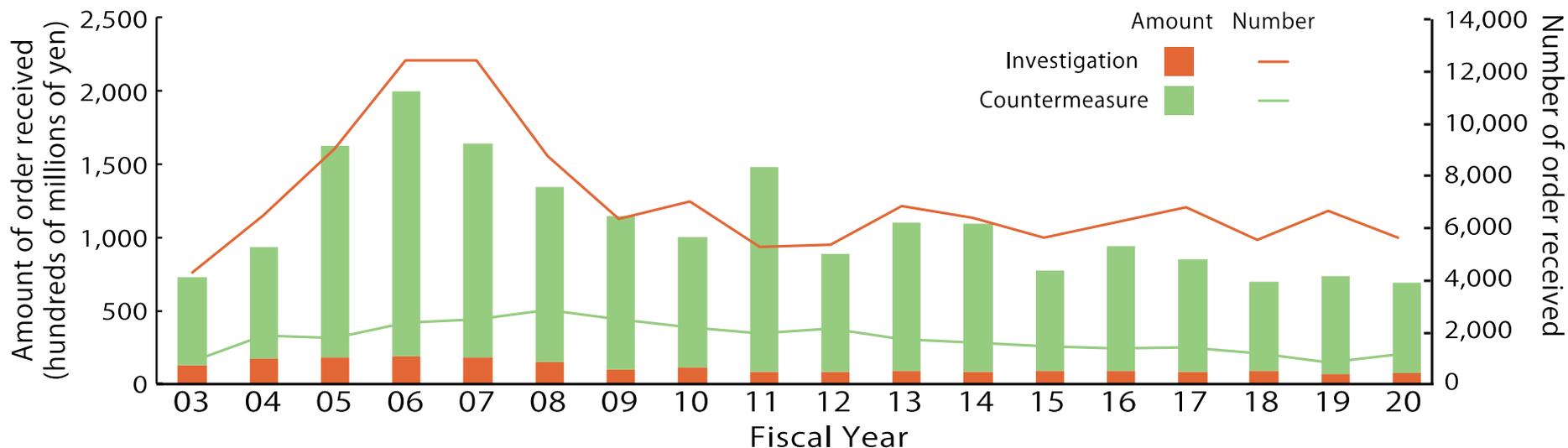


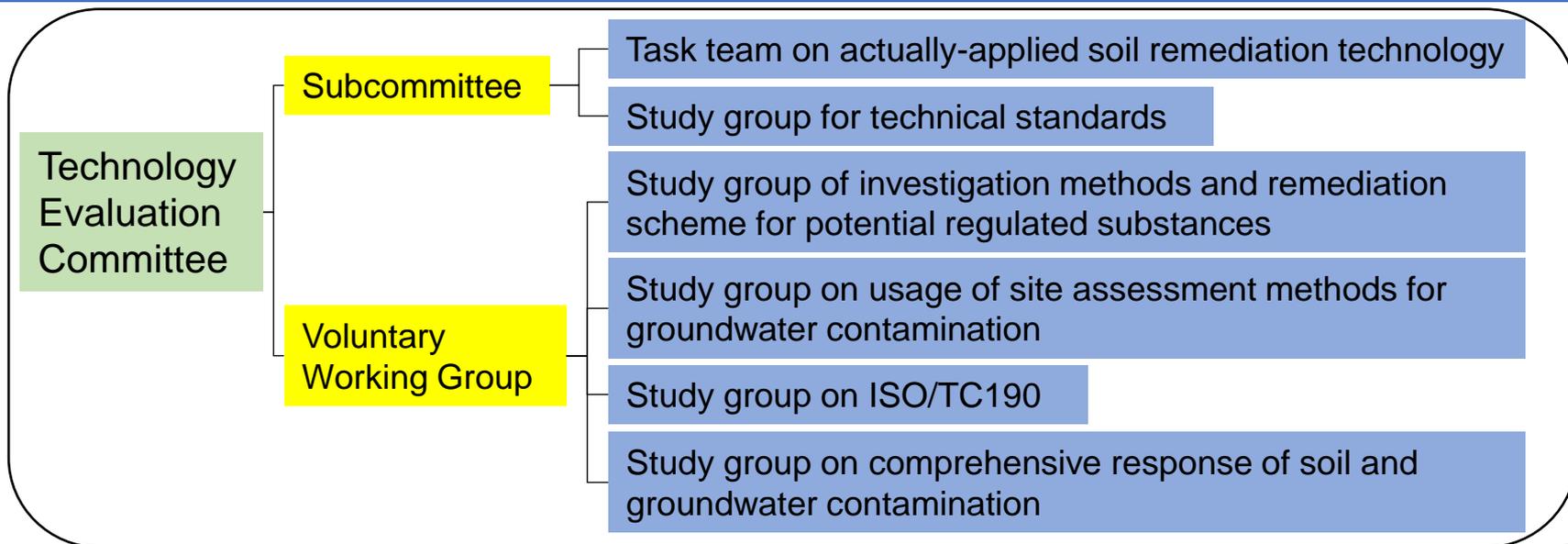
Fig. The results of orders received by member companies for investigation and countermeasure to soil contamination.



Activities of GEPC

1. Improves Investigation & Countermeasure Techniques and Evaluation & Control Methods
2. Performs Study and Research in Japan and Overseas

The Technology Evaluation Committee is active in resolving technical issues related to the investigation and remediation of soil and groundwater contamination by harmful chemical substances. The committee also studies solutions to various issues related to the review of the Soil Contamination Countermeasures Act and Environmental Quality Standards, and conducts research on risk assessment, remediation methodologies for a sustainable society, and harmonization of national and international standards.



Activities of GEPC

3. Conducts Awareness-Raising and PR Activities

The GEPC holds study meetings, seminars, academic symposiums and exhibitions for the purpose of disseminating knowledge and techniques on soil and groundwater contamination and their remediation. The GEPC also publishes reports that introduce the above activities and their outcomes, as well as a mail magazine.

1) Publication of Books and Reports

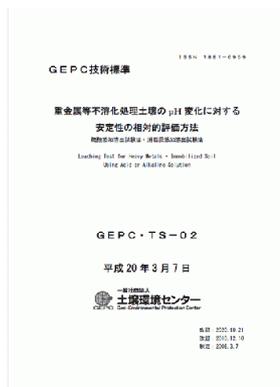
2) Seminar (Twice a year)

3) Field trip (Once a year)

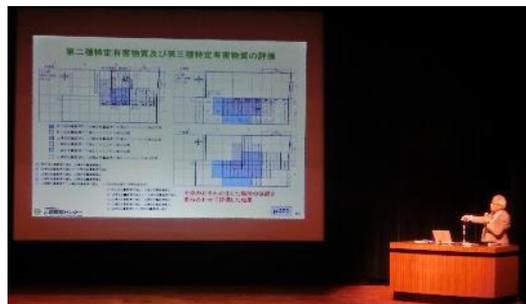
4) GEPC mail magazine (Several times a month)

5) Soil and Groundwater Remediation Technology Expo (biannually, Joint sponsorship)

6) Symposium on Soil and Groundwater Contamination and Remediation (annually, Joint sponsorship)



1) GEPC technical Standard



2) GEPC seminar



3) Field trip



6) Symposium

Activities of GEPC: 4. Implements a Qualification System

The GEPC carries out the following work of granting **qualifications** to engineers and managers to help improve the reliability of investigation into soil and groundwater contamination and its remediation work.

- 1) **Authorized Geo-Environmental Senior Engineer (Dojyo-kankyo kanri-shi)**
This qualification is granted to reliable senior engineers who have appropriate knowledge and judgment ability with respect to performing investigation and remediation of soil and groundwater contamination. *(Eligible persons: 534 as of March 2021)*
- 2) **Authorized Geo-Environmental Engineer for Safety of Field Work (Dojyo-kankyo hozen-shi)**
This qualification is granted to reliable engineers who have the required skills for (1) Work safety, (2) Consideration for the environment (e.g., preventing dispersion of contamination), and (3) Quality control (ensuring the quality of field work). *(Eligible persons: 2,536)*
- 3) **Authorized Geo-Environmental Manager for risk management (Dojyo-kankyo risuku kanri-sya)**
This qualification is granted to land managers who have basic knowledge for determining the state of contamination around a factory site in order to prevent soil and groundwater contamination and maintain and improve the asset value of land. *(Eligible persons: 5,091)*

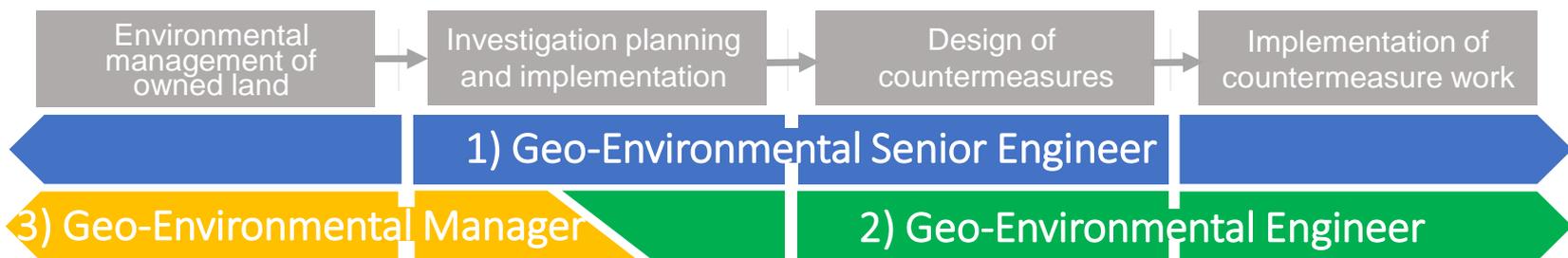
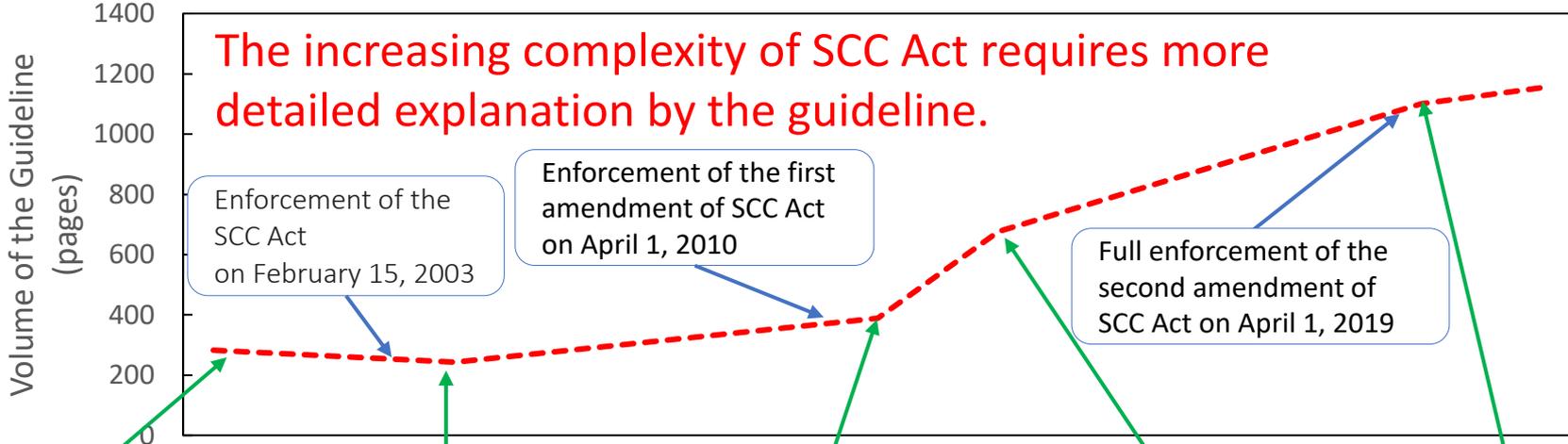


Fig. Coverage of each qualification

Activities of GEPC: Contracted work with the Government

GEPC has been contracted by the Ministry of the Environment to develop guidelines for the Soil Contamination Countermeasure Act (SCC Act) and examine the Environmental Quality Standards for soil, which contribute to the establishment and operation of the legal system.



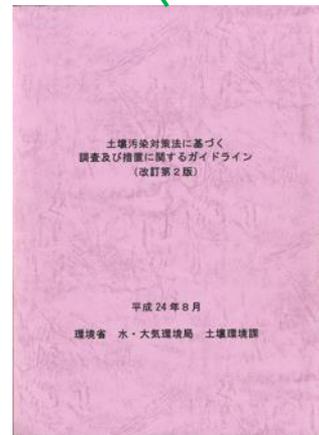
January 1999



September 2003



July 2010



August 2012

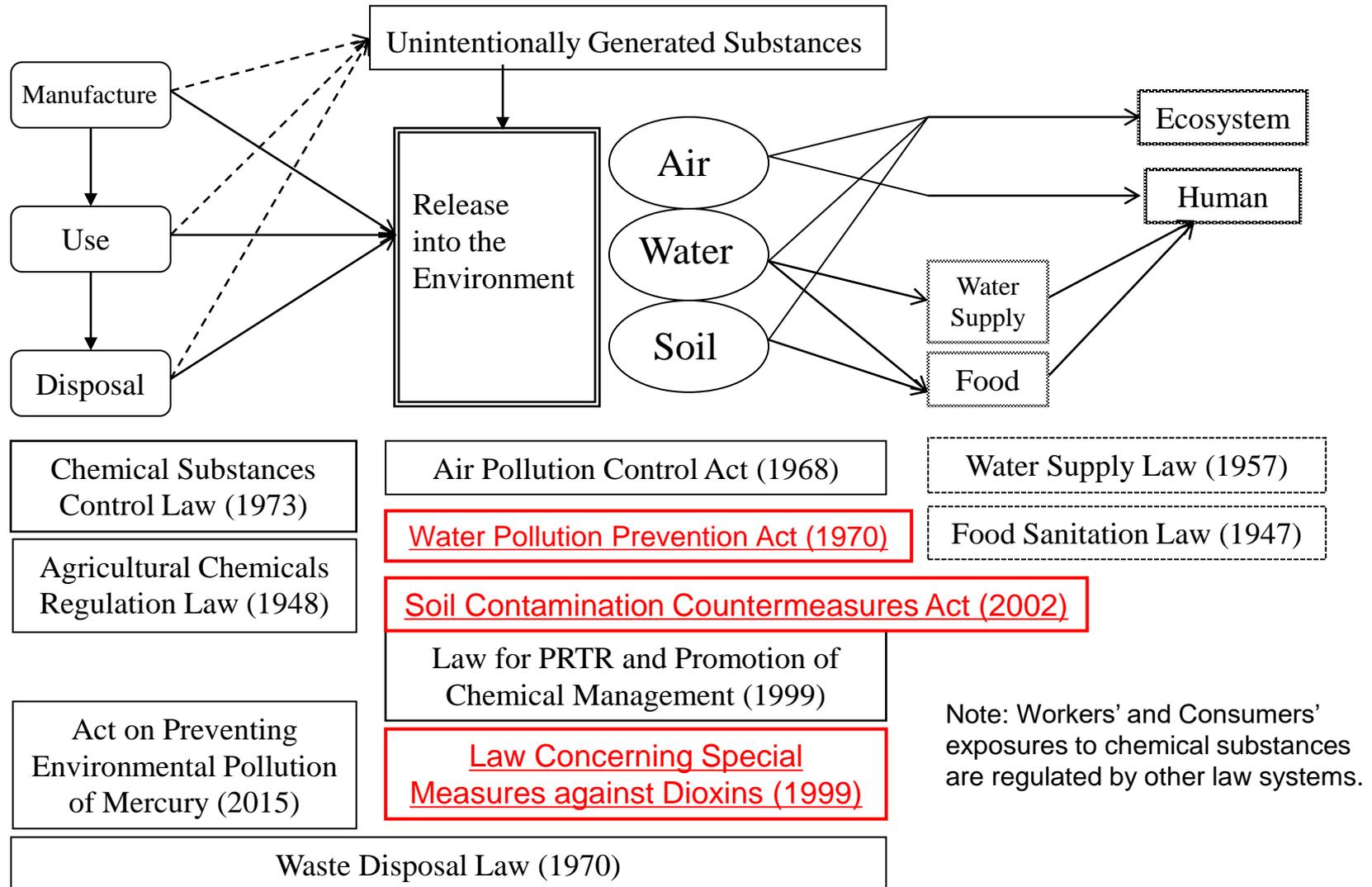


May 2019

2. Measures against groundwater pollution

3. Measures against soil contamination

Regulatory Framework for Environmental Risk Management of Hazardous Substances



Environmental Quality Standards (EQSs) for Groundwater

(Health Items only, as of Oct. 7, 2021)

| Items | Standard |
|-----------------------|---------------------|
| Cadmium | 0.003mg/l or below |
| Total Cyanogens | Not-detected |
| Lead | 0.01mg/l or below |
| Hexavalent Chromium | 0.02mg/l or below |
| Arsenic | 0.01mg/l or below |
| Total Mercury | 0.0005mg/l or below |
| Alkyl Mercury | Not-detected |
| PCB | Not-detected |
| Dichloromethane | 0.02mg/l or below |
| Carbon tetrachloride | 0.002mg/l or below |
| Chloroethylene* | 0.002mg/or below |
| 1,2-Dichloroethane | 0.004mg/l or below |
| 1,1-Dichloroethylene | 0.1mg/l or below |
| 1,2-Dichloroethylene* | 0.04mg/l or below |

| Items | Standard |
|---------------------------------------|---------------------|
| 1,1,1- Trichloroethane | 1mg/l or below |
| 1,1,2- Trichloroethane | 0.006mg/l or below |
| Trichloroethylene | 0.01mg/l or below |
| Tetrachloroethylene | 0.01mg/l or below |
| 1,3-Dichloropropene | 0.002mg/l or below |
| Thiuram | 0.006mg/l or below |
| Simazine | 0.003mg/l or below |
| Thiobencarb | 0.02mg/l or below |
| Benzene | 0.01mg/l or below |
| Selenium | 0.01mg/l or below |
| Nitrate-Nitrogen/ Nitrite-Nitrogen | 10mg/l or below |
| Fluorine | 0.8mg/l or below |
| Boron | 1mg/l or below |
| 1,4-dioxane | 0.05mg/l or below |
| Dioxins | 1 pg-TEQ/l or below |

* Different from the EQS items for surface water

Causes of groundwater pollution (FY 2019)

Number of cases*

Total: 6,352

3,500

3,000

2,500

2,000

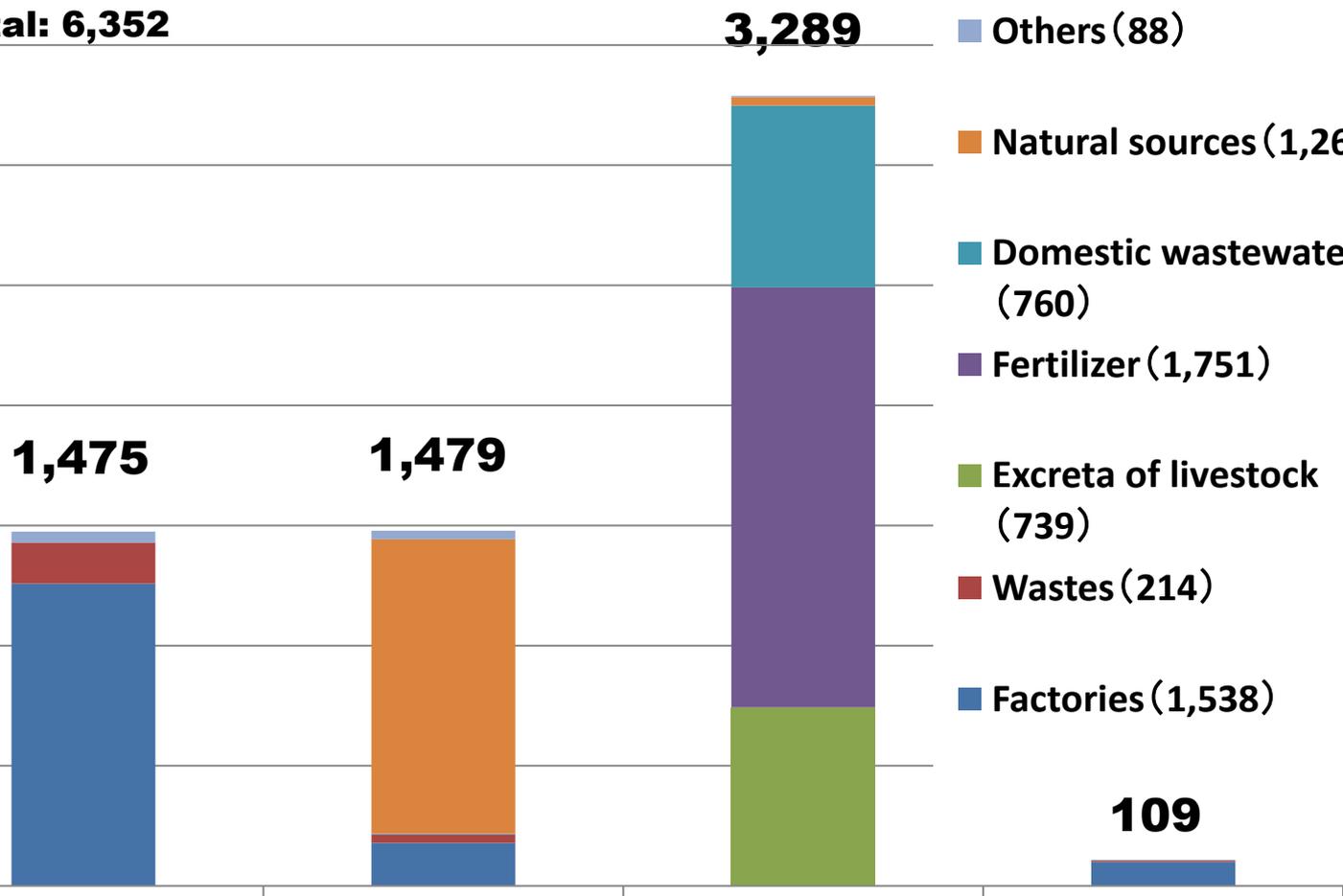
1,500

1,000

500

0

- Others (88)
- Natural sources (1,262)
- Domestic wastewater (760)
- Fertilizer (1,751)
- Excreta of livestock (739)
- Wastes (214)
- Factories (1,538)



VOC

Heavy metals

Nitrate nitrogen and nitrite nitrogen

Combined pollution

Number of Wells*
Total: 4,782

1,332

1,468

1,879

103

*The total number of cases and wells are different because plural causes may be considered. (Results of questionnaire survey on groundwater pollution conducted and summarized by MOE in 2021)

Measures against groundwater pollution

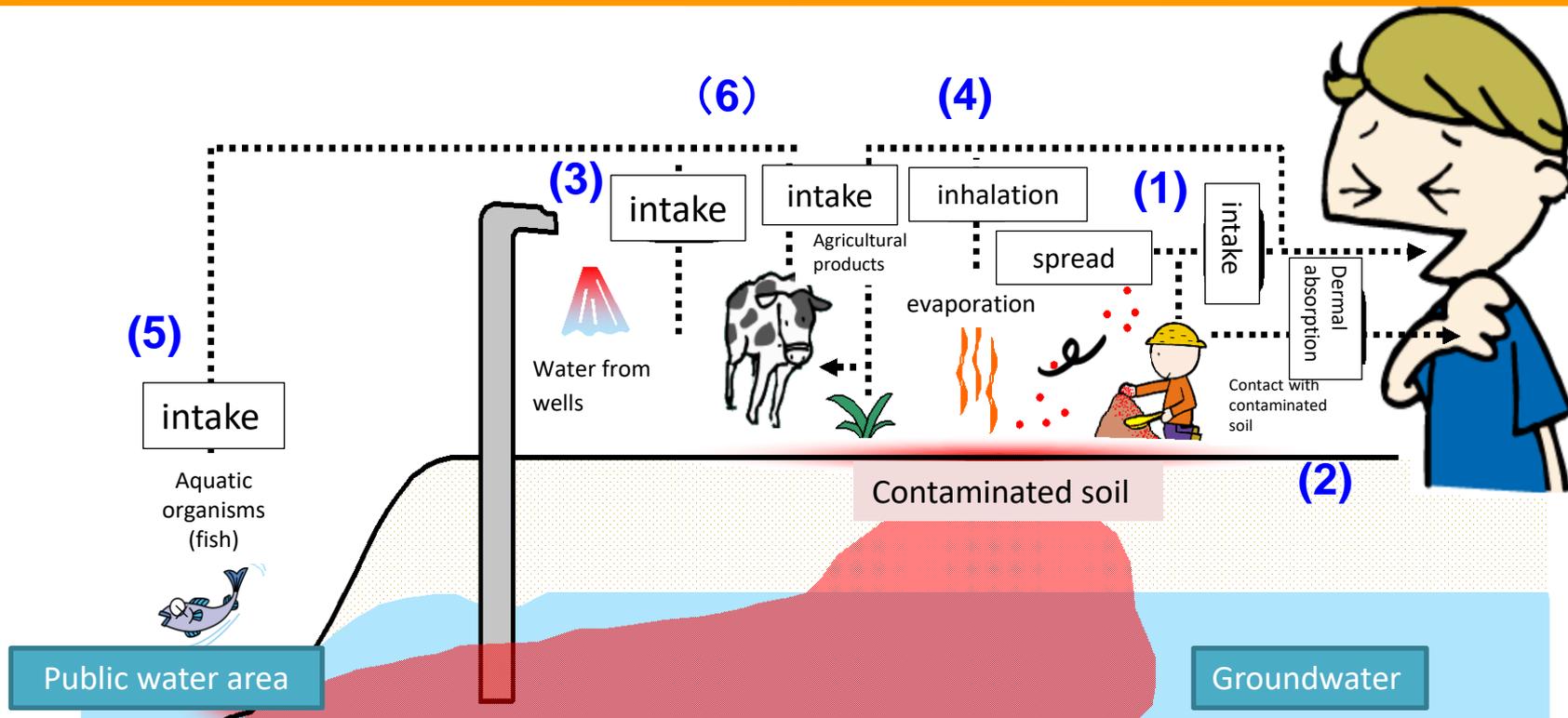
- Regulations stipulated in the Water Pollution Prevention Act (First introduced in 1989, added in 1996 and 2011)
 - Restrictions of permeation of harmful substances into groundwater (from facilities where hazardous substances are used, almost prohibition) and monitoring
 - Provisions of order for purification
 - Provisions of measures against accidental releases
 - Obligation to comply structural standards and to conduct regular examination to prevent groundwater pollution (from storage facilities of hazardous substances)
- Other measures
 - Guideline developed summarizing comprehensive measures to be taken against nitrate nitrogen and nitrite nitrogen
 - Stop using contaminated groundwater for drinking

Measures against soil contamination

EQSs for soil are set based on the Basic Environment Act and three laws have been implemented to recover soil contamination

- Law Concerning the Control of Soil Contamination in Agricultural Land (1970)
 - Designate the agricultural area polluted by specific hazardous substances (Cd, Cu, As) and promote its remediation.
- Law Concerning Special Measures against Dioxins (1999)
 - Set the TDI and EQSs for dioxins and stipulates comprehensive measures to reduce the emission, release and contamination by dioxins.
- Soil Contamination Countermeasures Act (2002) (To be explained later)
 - Conduct the investigation of soil contamination, designate the area in cities polluted by specific hazardous substances and promote its risk management

How does soil contamination cause health issues?



- 1. Ingestion of contaminated soil (including soil particulates in the atmosphere)** } Risk of direct ingestion
- 2. Dermal absorption from direct contact with contaminated soil** }
- 3. Ingestion of groundwater contaminated by hazardous substances eluted from contaminated soil**
→ Risk of ingestion through groundwater
- 4. Inhalation of hazardous substances emitted from contaminated soil into the atmosphere**
- 5. Discharge of soil containing hazardous substances into the public water area → accumulation in aquatic organisms → human ingestion**
- 6. Accumulation of hazardous substances in crops and livestock raised in contaminated land**
→ human ingestion – risk of indirect ingestion through agricultural products

History of Soil Contamination and Measures in Urban areas

- 1975 Soil contamination caused by Hexavalent chromium compounds was found in the site of a closed chemical factory
- 1980's Groundwater contamination caused by organochlorine compounds (trichloroethylene, etc.) becomes a social issue
- 1991 Establishment of “Environmental Quality Standards for Soil ”
- 1980's and 90's Drawing up of several administrative guidance

Various difficulties in proceeding the legislation

- Land (=private property) contamination
- Soil contamination: negative legacy of the past, stock-type contamination
- Depending on the type of land-use, there is no adverse effect on health

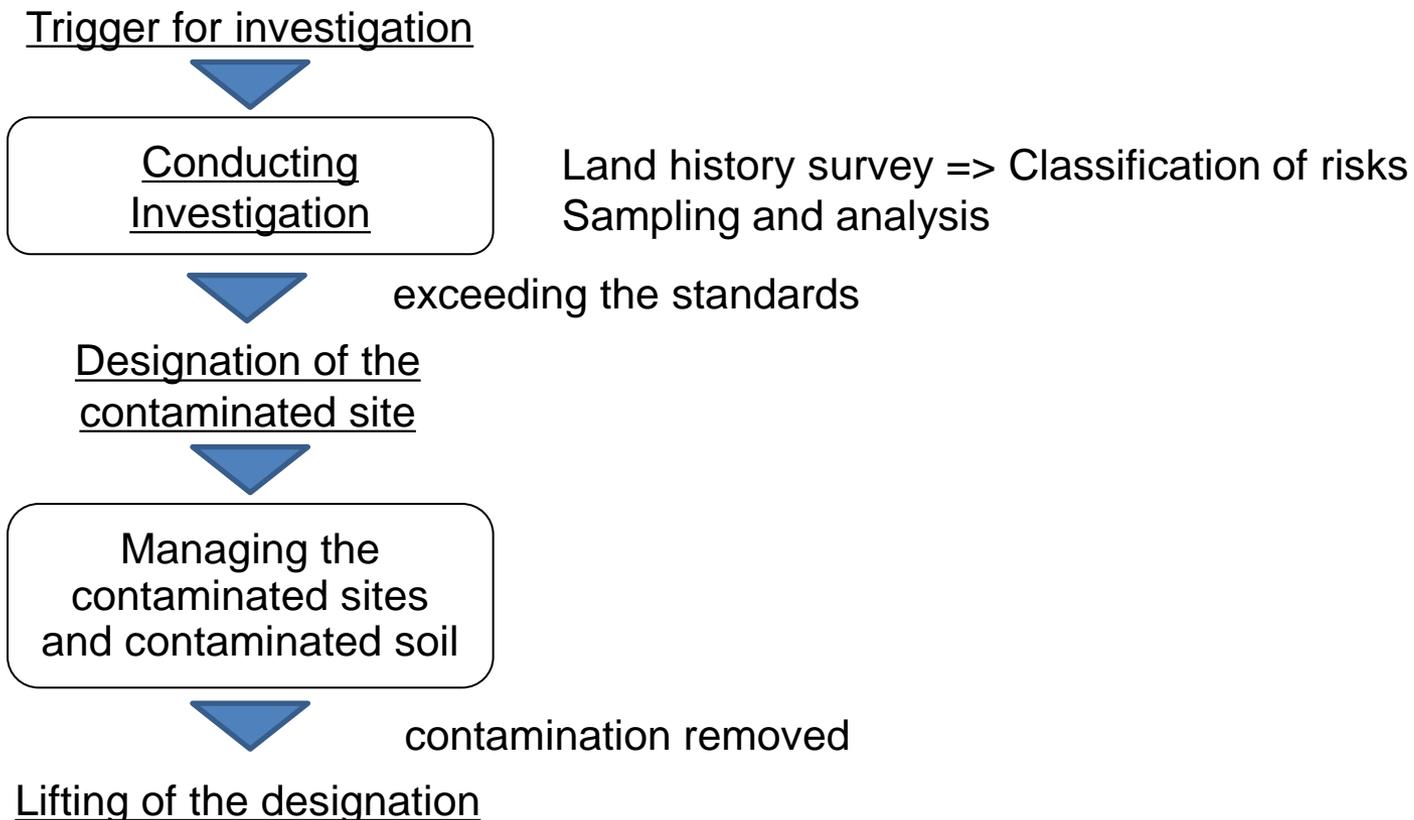
Finally, however, it was agreed that a rule-based approach be necessary to conduct investigation and promote countermeasures, due to the increasing cases of soil contamination and health concerns



Soil Contamination Countermeasures Act enacted (2002)

Outline of Soil Contamination Countermeasures Act

- Soil Contamination Countermeasures Act was enacted in 2002 (Amended in 2009 and 2017).
- The Act stimulates procedures for countermeasures mainly consisting of investigation and management of contaminated sites.



Types of Designated Hazardous Substances

Class 1*

(Volatile Organic Compounds)

- Chloroethylene
- Carbon tetrachloride
- 1,2—Dichloroethane
- 1,1—Dichloroethylene
- 1,2—Dichloroethylene
- 1,3—Dichloropropene
- Dichloromethane
- Tetrachloroethylene
- 1,1,1—Trichloroethane
- 1,1,2—Trichloroethane
- Trichloroethylene
- Benzene

Class 2**

(Heavy Metals)

- Cadmium and its compounds
- Hexavalent Chromium compounds
- Cyanides compounds
- Mercury and its compounds
- Selenium and its compounds
- Lead and its compounds
- Arsenic and its compounds
- Fluorine and its compounds
- Boron and its compounds

Direct Ingestion Risk (9 items)

Class 3*

(Agrochemicals and PCBs)

- Simazine
- Thiuram
- Thiobencarb
- PCB
- Organic phosphorus compounds

* Soil Leachate Standard (mg/L) is set as Designation Standard to prevent risks of ingestion through groundwater.

** Soil Leachate Standard (mg/L) and Soil Content Standard (mg/kg) are set to prevent risks of ingestion through groundwater and direct ingestion of soil.

Note: In addition, Soil Content Standard on dioxins is set under the Law Concerning Special Measures against Dioxins.

Investigating Soil Contamination

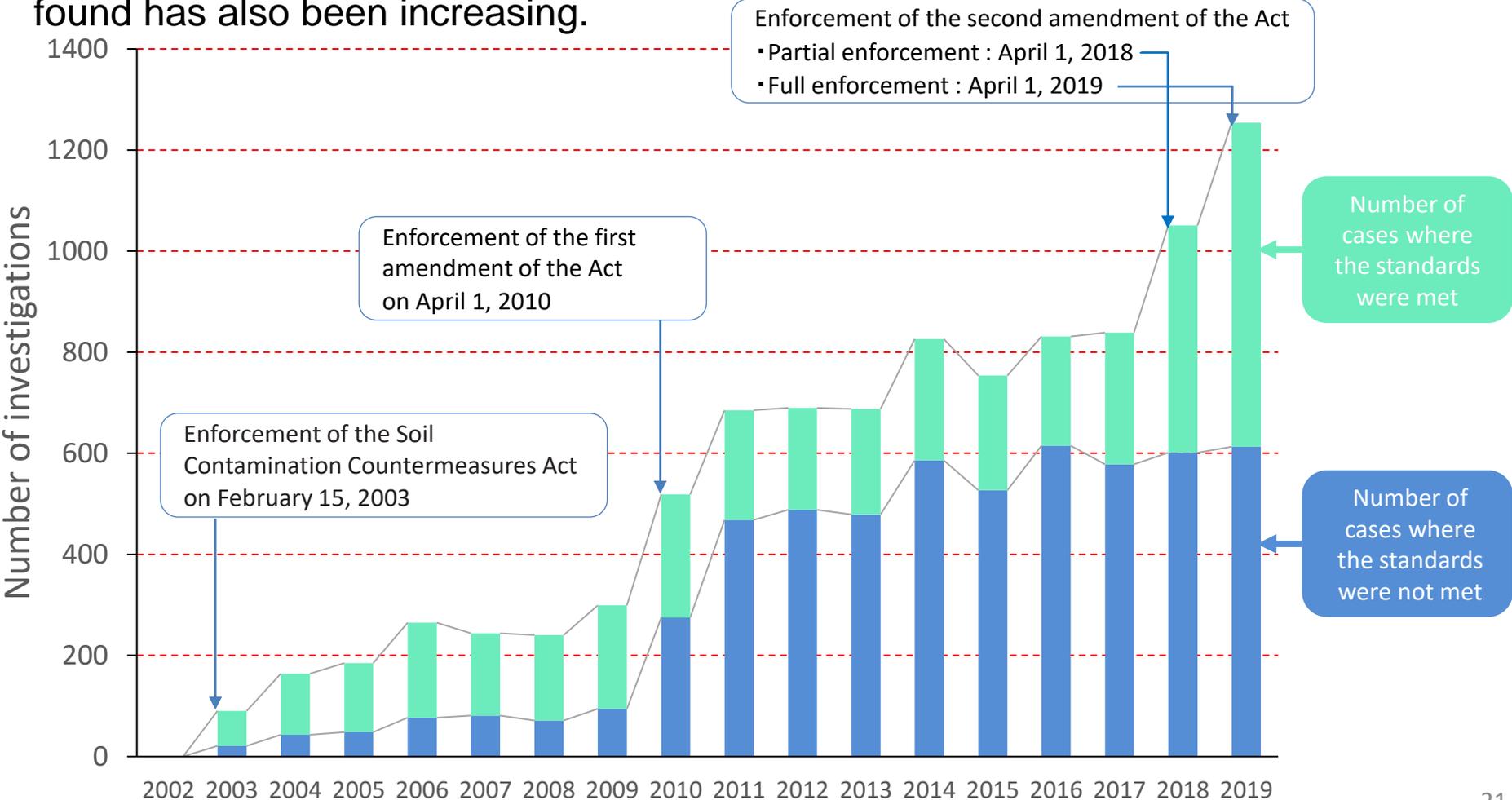
The owner, etc.* of the land shall have authorized institutions conduct investigation on soil contamination in the following situation.

(*owner, manager or occupier)

- When the use of specified facilities using hazardous substances is terminated (Art. 3)
- When the prefectural governor, having received notification of changes to the form or nature of land of a certain size or more ($\geq 3,000 \text{ m}^2$, or $\geq 900 \text{ m}^2$ where a specified facility using hazardous substances is currently located), finds that the land has possible soil contamination (Art. 4)
- When the prefectural governor finds that land is suspected to cause any harm to human health, due to soil contamination (Art. 5)
- If voluntary investigations reveal soil contamination, the owner, etc. of the land may file an application for designation of areas with the prefectural governor (Art. 14)

Number of cases where soil contamination was found by year (from FY 2002 to FY 2019)

The number of investigations into soil contamination grasped by prefectural governments, etc. under the Soil Contamination Countermeasure Act has been increasing year by year. The number of cases where soil contamination was found has also been increasing.



Designation of Contaminated Sites

- Prefectural governor judges the compatibility with standards (soil leachate standards and soil content standards)
- If not complying, prefectural governor judges the risk that may cause harm to human health.
- If risk that may cause harm to human health is identified, the site shall be designated as an area which requires measures to block the intake routes of contamination.
- If risk that may cause harm to human health is not identified, the site shall be designated as an area which does not require immediate measures but requires advance notification on changing land form or nature.
- Contaminated soil in the areas cannot be brought out in principle. The soil can be brought only to processing facilities*. And when the soil is transported, it is necessary to obey the regulation of the Act.

(*with some exception)

The Designation Process of Contaminated Areas

Report investigation results to the prefectural governors (or city mayors*)

(*Those identified by Cabinet Order)



Non-designated areas

The identification process of risk that may cause harm to human health

- (1) Where in the surrounding areas people have access to drinking groundwater
- (2) Where it is accessible to the general public

Area which requires measures (Article 6)

Area requiring measures for contamination removal, etc. since the existence of intake routes of contamination have risk that may cause harm to human health.
 → The owner, etc. of the land shall prepare a plan for contamination removal, etc. concerning the instruction of the prefectural governor, receive confirmation, implement measures for contamination removal, etc. pursuant to the confirmed plan, and make a report. (Article 7)
 → In general, it is prohibited to change the form or nature of land. (Article 9)

Area for which changes to form or nature require notification (Article 11)

Area not requiring measures for contamination removal, etc. since there are no intake routes of contamination and no risk that may cause harm to human health (including areas where intake routes have been blocked)
 → Any person who intends to make changes to the form or nature of land shall notify the prefectural governor of the changes. (Article 12)

The owner, etc. may claim the cost of the plan and measures to be implemented against the person that caused the contamination (Article 8)

※When the contamination is removed, designation of areas is cancelled.

※There is an official announcement when each prefecture designates or cancels areas.

Countermeasures stated in the Act

Concept of the Act

- Managing environmental risk (Risk = hazard x exposure (intake))
- Blocking the ingestion pathway (Removing contaminated soil is not the emphasis of the Act)

Ingestion from drinking groundwater

In cases where not complying with the soil leachate standard, and groundwater is used for drinking



- **Monitoring** when there is no groundwater contamination
- **Containment** when there is groundwater contamination

Ingestion from physical contact with soil

In cases where not complying with the soil content standard, and the site is accessible to the general public



Embankment

- * Complete removal of contaminated soil may be required in limited cases (e.g., when there are possibilities of the effects of embankment being lost due to frequent changes to the land characteristics at sandpit for babies and infants)

Countermeasures for soil not complying with the soil standards

| | |
|--|--|
| Countermeasures for risks caused by groundwater ingestion | In-situ containment, measurement of groundwater quality, containment by water sealing, prevention of the expansion of contaminated groundwater, removal by excavation, in-situ remediation, containment by shielding, insolubilization (in-situ insolubilization, backfilling of insolubilized soil) |
| Countermeasures for risks caused by direct ingestion of soil | Embankment, pavement, prohibiting intrusion into the site, replacement of soil, removal of contaminated soil (removal by excavation, in-situ remediation) |

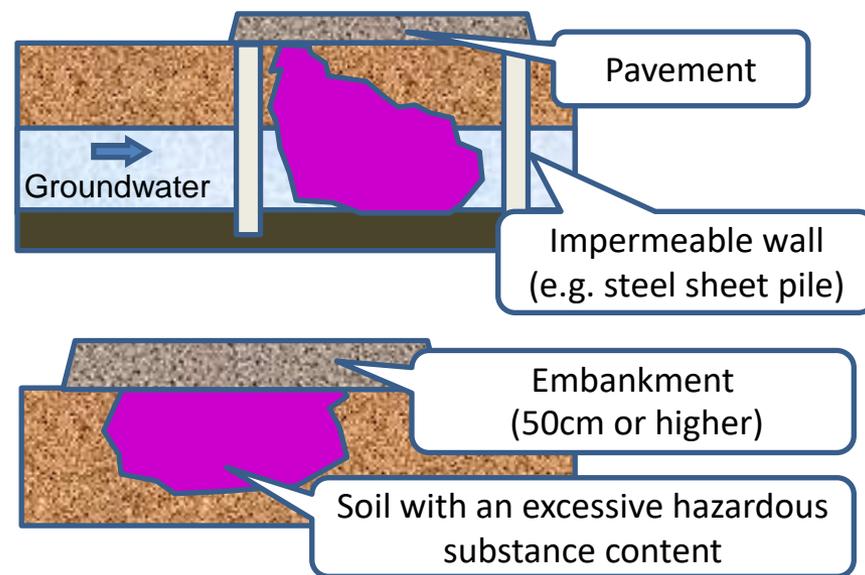
■ EXAMPLE

In-situ containment

Hazardous substances (e.g., mercury) are contained in an artificial (impermeable) wall and an impermeable geological stratum

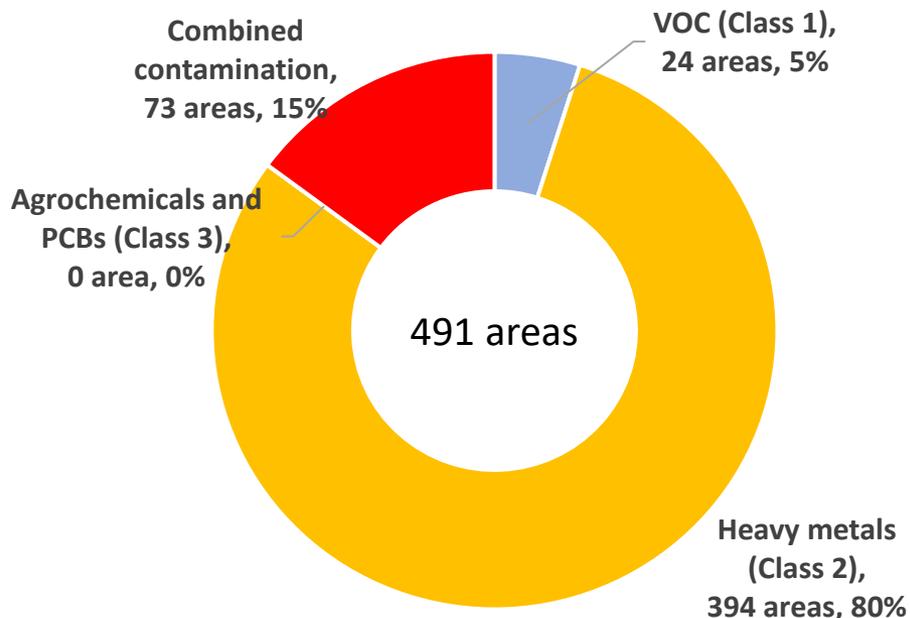
Embankment

Soil exceeding the hazardous substance concentration tent standard is covered by embankment to prevent exposure.



Designated areas (by Designated Hazardous Substances) (FY2019)

- The largest number of areas were designated due to the **contamination by heavy metals (80%)** in FY2019.
- Combined contamination was 15%.



Actions taken in designated areas (FY2019)

- **Removal by excavation occupies a large proportion (about 80%)** of the actions taken in Areas which Require Measures, etc.

| | | Number of actions implemented at Area which Requires Measures (2003-2019) | Number of actions implemented at Area which Requires Notification* (2003-2019) | Total (2003-2019) | |
|------------------------------------|---|---|--|-------------------|----|
| Risk by direct ingestion | Pavement | 19 | 165 | 184 | |
| | Keep out | 20 | 66 | 86 | |
| | Soil replacement | in the area | 5 | 39 | 44 |
| | | outside the area | 3 | 14 | 17 |
| | Embankment | 4 | 76 | 80 | |
| Risk by ingestion of groundwater | Measurement of groundwater quality | 233 | 261 | 494 | |
| | In-situ containment | 10 | 10 | 20 | |
| | Containment by water sealing | 4 | 8 | 12 | |
| | Prevention of the expansion in the area of contaminated groundwater | 22 | 20 | 42 | |
| | Containment by shielding | 0 | 2 | 2 | |
| | Insolubilization | In-situ insolubilization | 9 | 4 | 13 |
| Back filling of insolubilized soil | | 7 | 17 | 24 | |
| Removal of contaminated soil | Removal by excavation (percentage) | 659 (75.5%) | 2,694 (81.4%) | 3,353 (80.2%) | |
| | In-situ remediation | 132 | 102 | 234 | |
| Others | | 9 | 165 | 174 | |
| Number of answers | | 873 | 3,308 | 4,181 | |

*Area for which changes to form or nature require notification

Regulations concerning carrying-out, etc. of contaminated soil

- Regulations concerning carrying-out of soil within areas which require measures and areas for which changes to form or nature require notification (Articles 16, 17 and 18) (prior notification, order to revise plan, conformity to standards for transport), with some exception for the soil of areas contaminated by nature.
- Obligations to deliver and preserve control manifests concerning contaminated soil (Article 20)
- License system of contaminated soil processing business (Article 22)

Other Measures

- Improvement of the reliability of designated (i.e., authorized) investigation institutions (renewal of designation, appointment of a technical manager, etc.) (Articles 32 & 33)
- Subsidies by the fund for soil contamination countermeasures (granting subsidies for measures for contamination removal, etc. if a person responsible for contamination is unclear or does not exist, and the ability of the owner etc. to bear cost is low) (Articles 45&46)

Disposal process of contaminated soil

- Contaminated soil carried out from the designated areas shall be processed at licensed facilities (119 facilities as of July 2021)
- 1.8 million tons of contaminated soil were processed based on the Act. (4.48 million tons including the soil outside the scope of the Act)



Remediation facilities (60)



Cement factories (20)

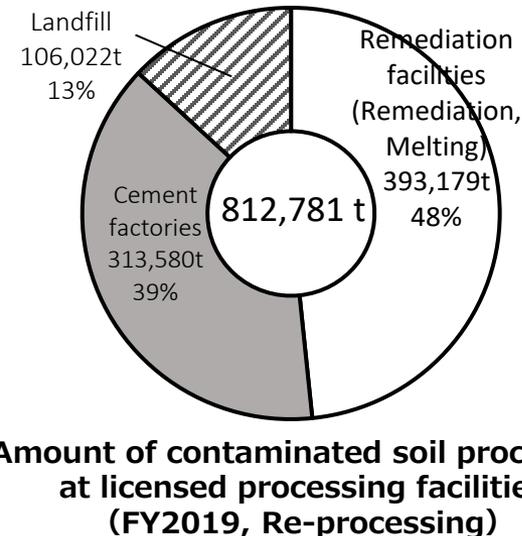
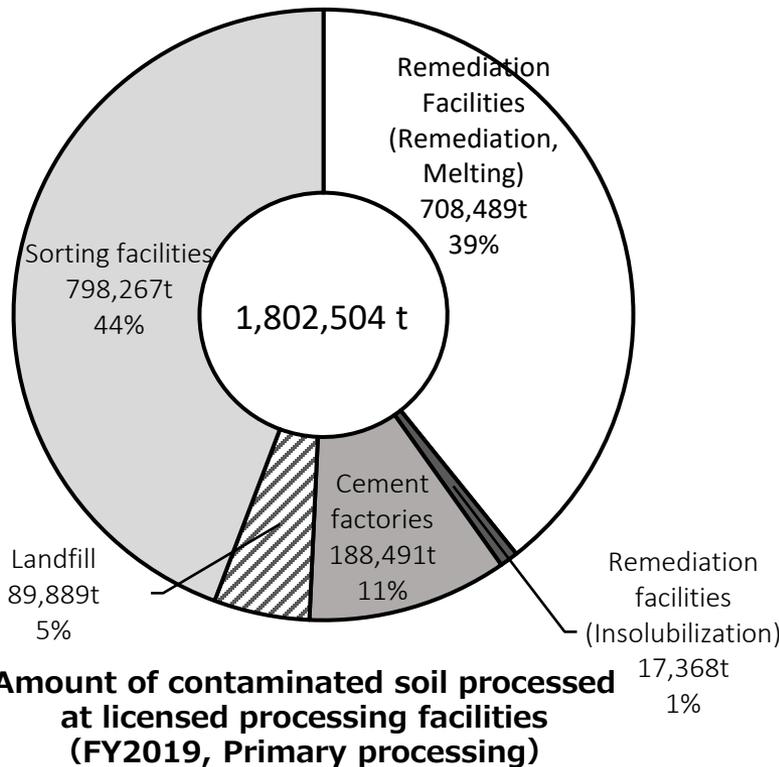


Landfill (40)



Sorting facilities (49)

Note: In addition, one "Facility for the use of soil contaminated by nature" is licensed.



※ If the contaminated soil after primary processing does not meet the standards, additional processing is required.

Thank you for your attention!

(Homepage)(in English)

Geo-Environmental Protection Center (GEPC)

<http://www.gepc.or.jp/english/eindex.html>

Ministry of the Environment (MOE)

<http://www.env.go.jp/en/water/index.html>