



みんなで止めよう温暖化  
キーム・マイナス6%

# CCS Regulatory Development in Japan

CCS in the EU and Japan  
Seminar in Brussels, 12<sup>th</sup> November, 2008

Satoshi SUZUKI  
Japan NUS Co., Ltd.

# Outline



みんなで止めよう温暖化  
キーム・マイナス6%

1. **Amendments to the London Protocol 1996**
2. **Regulatory development on offshore CCS in Japan**
3. **Summary of the management framework of offshore CCS by the *Marine Pollution Prevention Law***

# Amendments to the London Protocol 1996

## ➤ August, 1996

Adoption of the London Protocol 1996 (LP)

## ➤ March, 2006

The LP entered into force, enabling amendment by the Contracting Parties to the LP alone

## ➤ April, 2006

Proposal for amendments to the Annex I to the LP by Australia, France, Norway and UK

## ➤ November, 2006 (LC28/LP1)

Adoption of the amendments to the Annex I to the LP

## ➤ February, 2007

Amendments entered into force

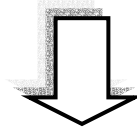
## ➤ November, 2007 (LC29/LP2)

CO2-WAG accepted in principle

# Regulatory Development of Offshore CCS in Japan (1)

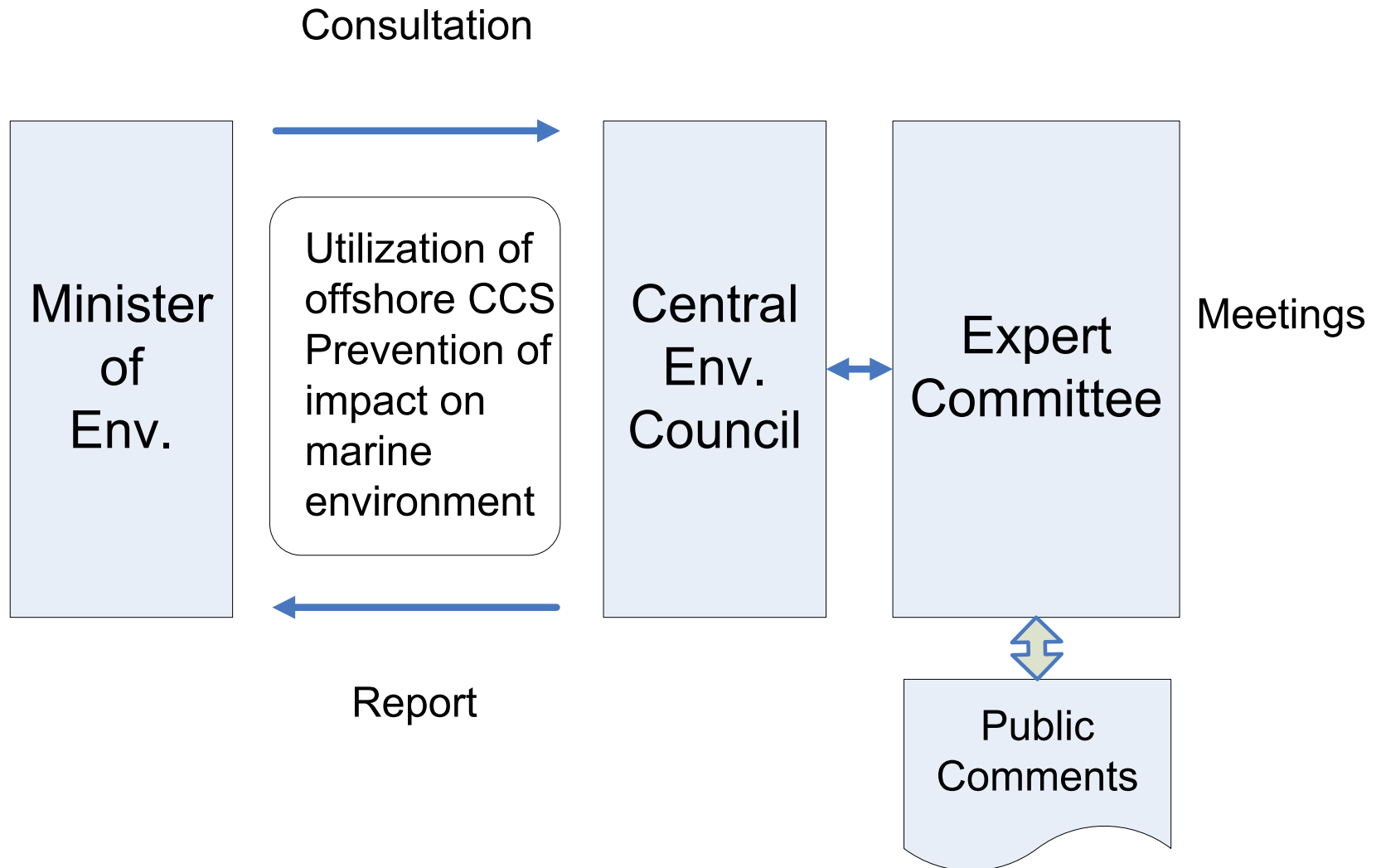
## Marine Pollution Prevention Law:

- Comprehensive law for protection of marine environment
- National law to implement international treaties, e.g. LC/LP, MARPOL, OPRC, etc.

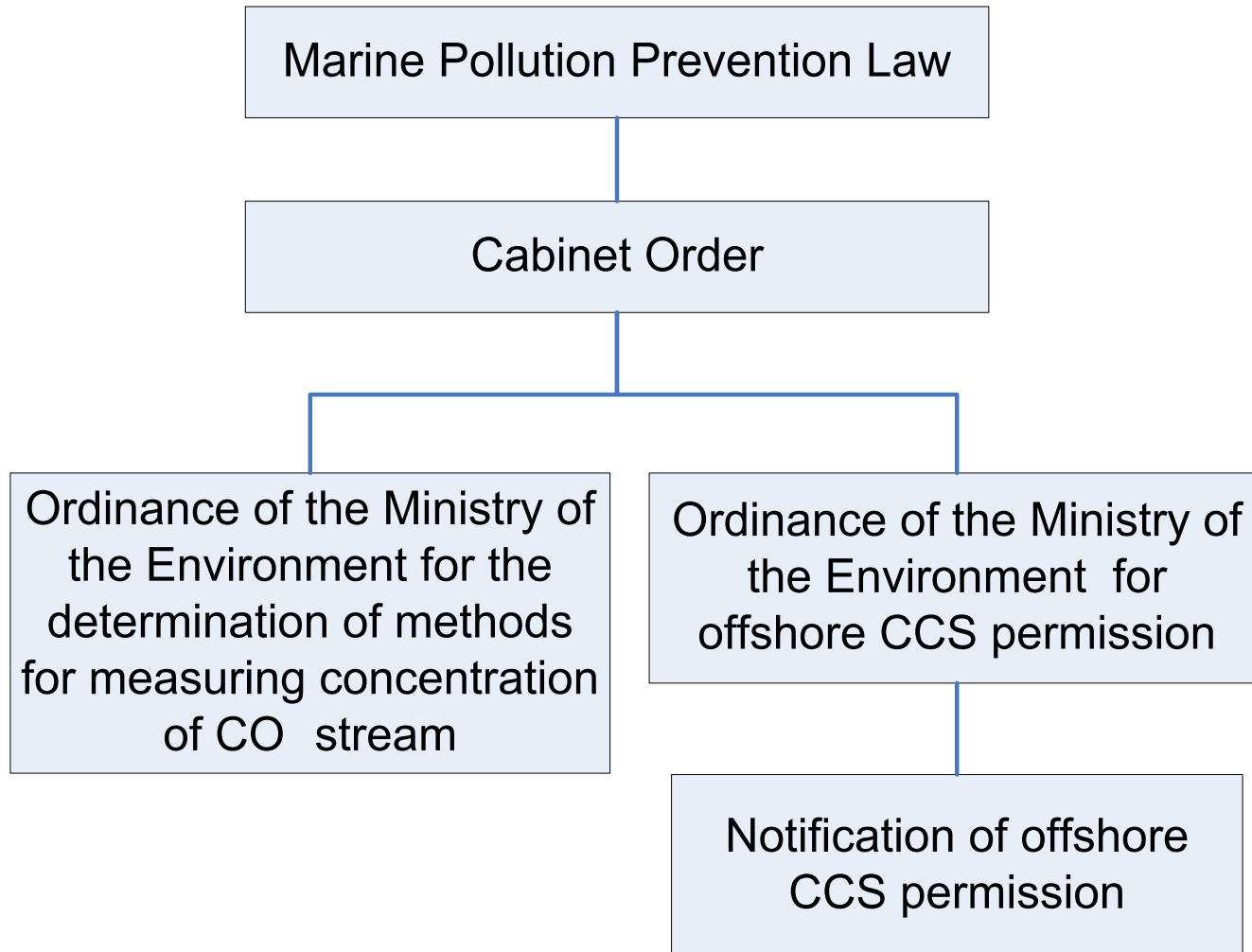


Amendment is required in accordance with LP amendment

# Regulatory Development of Offshore CCS in Japan (2)



# Regulatory Development of Offshore CCS in Japan (3)



# Outline of the Amendments (1)

## 1 Prohibition of disposal of oil, hazardous liquid substances, and wastes under the seabed

No one shall dispose oil, hazardous liquid substances, and wastes under the seabed, **except** for CO<sub>2</sub> stream storage under the seabed with permit from Minister of the Environment (Article 18.7)

# Outline of the Amendments (2)

## 2 Provisions for the permit for CO<sub>2</sub> stream storage under the seabed

- (1) Anyone intending to dispose CO<sub>2</sub> stream under the seabed must obtain a **permit** from Minister of the Environment (Article 18.8)
- (2) The Minister of the Environment shall not issue a permit for the CO<sub>2</sub> stream storage under the seabed unless it meets all conditions required such as
  - “the storage site under the seabed and the method taken for the storage will **not harm** marine environmental protection at the storage site” and
  - “there is **no other appropriate disposal** is available other than storage under the seabed”. (Article 18.9)
- (3) A person holding a permit for CO<sub>2</sub> stream storage under the seabed must **monitor** status of the pollution at the storage site and **report** monitoring results to Minister of the Environment (Article 18.12)

# Outline of the Amendments (3)

## 3 Designation of a registered area

- (1) The Minister of the Environment designates a CO<sub>2</sub> storage site under the seabed as a **registered area**, in order to prevent potential impact on marine environment from CO<sub>2</sub> leakage by altering the seabed and the sub-seabed features (Article 18.15; details are provided by Cabinet Order )
- (2) **Notification** to The Minister of the Environment is required for activities which alter the seabed and the sub-seabed features within a registered area. Minister of the Environment has competence to order a change of project plan (Article 19.2).

## 4 Validation

The Minister of the Environment has competence to order **submission of a report** on CO<sub>2</sub> storage under the seabed and conduct **inspection** for the purpose of implementation of the Law (Article 48)

# Outline of the Amendments (4)

## 5 Exemption and Purity Standards

### (1) Exemptions (Cabinet Order Article 11.4)

- CO<sub>2</sub> from offshore operation
- EOR/EGR operation

### (2) Purity Standards (Cabinet Order Article 11.5)

(The details will be explained later.)

## 6 Period of Permit

Re-permit is required every **5** years (Notification of the MOE 2-2-(1)).

# Documents Required for a Permit

- Application for a Permit (Ordinance of the MOE, Article 1)
  - **Project Plan**
  - **Monitoring Plan**
  
- Attachments (Ordinance of the MOE, Article 4 and 5 )
  - 1. Site selection report**
  - 2. Environmental impact assessment report**
  3. Explanation for no appropriate disposal is available other than sub-seabed storage
  4. Financial capability of the applicant
  5. Technical capability of the applicant
  6. Outline of the entire project (beyond permitting period)

# Project Plan

(Ordinance of the MOE, Article1-2)

## ■ Project plan should include:

- Injection period
- Characterization of CO<sub>2</sub> stream
- Amount of CO<sub>2</sub> stream to be stored
- Amount of CO<sub>2</sub> stream already stored
- Location and dimension of storage site
- Procedure for CO<sub>2</sub> injection
- Mitigation and remediation measures in case of leakage

# Site Selection Report

## (Ordinance of the MOE, Article 5)

Site selection report should cover followings:

- (1) Characteristics of the sub-seabed geological formation
- (2) Potential migration and leakage paths of CO<sub>2</sub> stored under the seabed
- (3) Spatial extent of CO<sub>2</sub> stored within the sub-seabed geological formation, and estimated CO<sub>2</sub> storage capacity
- (4) Characteristics of the marine environment of the storage site

# Site Selection Criteria

## (Ordinance of the MOE, Article2)

- **There is no record of significant movement in geological formations**
- **Possibility of significant movement in geological formations is low**
- Appropriate geological structure is present to prevent CO<sub>2</sub> leakage
- It is possible to monitor CO<sub>2</sub> storage and marine environment
- Mitigation measures can be taken in the area, in case of CO<sub>2</sub> leakage
- There is sufficient information on existence and location of habitats which need special protection

# **Environmental Impact Assessment Report**

## **(Ordinance of the MOE, Article 4)**

- (1) Characterization of the CO<sub>2</sub> Stream**
- (2) Location, spatial extent, and amount of potential CO<sub>2</sub> leakage**
- (3) Baseline data of marine environment at the storage site**
- (4) Evaluation of impact by potential CO<sub>2</sub> leakage**

# CO<sub>2</sub> Purity Standards

(Law, Article 18.7-2; Cabinet Order, Article 11.5)

CO<sub>2</sub> stream should consist overwhelmingly of CO<sub>2</sub> and meet the standards set by Cabinet Order

- CO<sub>2</sub> capture technology: Post combustion using amine solvents
- CO<sub>2</sub> purity:  $\geq 99\%$ (vol)\*
  - \*  $\geq 98\%$ (vol) for the stream captured from hydrogen production process at petroleum refinery
- No wastes or other matter are added

# Background for Setting Current CO<sub>2</sub> Standards

## ➤ Basis for the CO<sub>2</sub> concentration Standards

1. Higher concentration is desirable as a climate change mitigation option
2. Additional energy required for capturing more CO<sub>2</sub> should be considered

Table - 1

Technology		CO <sub>2</sub> concentration after separation/capture
Solvents	Chemical (amine)	99.9%
	Physical	Same or less than above
Sorbents		99%
Membrane	Polymeric	Under development Approx. 80%
	Inorganic	Under development
Oxy-fuel		94~95%

(NEDO, 2001)

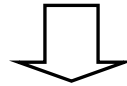
Table - 2

(%)

	SO <sub>2</sub>	NO	H <sub>2</sub> S	H <sub>2</sub>	CO	CH <sub>4</sub>	N <sub>2</sub> /Ar/O <sub>2</sub>	total
<b>COAL FIRED PLANTS</b>								
Post-combustion	<0.01	<0.01	0	0	0	0	0.01	<b>0.01</b>
Pre-combustion (IGCC)	0	0	0.01 -0.6	0.8 -2.0	0.03 -0.4	0.01	0.03 -0.6	2.1 -2.7
Oxy-fuel	0.5	0.01	0	0	0	0	3.7	4.2
<b>GAS FIRED PLANTS</b>								
Post-combustion	<0.01	<0.01	0	0	0	0	0.01	<b>0.01</b>
Pre-combustion	0	0	<0.01	1.0	0.04	2.0	1.3	4.4
Oxy-fuel	<0.01	<0.01	0	0	0	0	4.1	4.1

(IPCC, 2005)

- Low applicability of pre-combustion and Oxy-fuel in Japan at present
- Absorption process based on amine solvents is in practical level and possible to capture CO<sub>2</sub> with purity of  $\geq 99\%$ (vol)
- $\geq 98\%$ (vol) for the stream captured from hydrogen production process at petroleum refinery



### **Standards for CO<sub>2</sub> concentration at the time of amendment:**

1. Only consider the CO<sub>2</sub> capture technology using amine solvent\*
2. CO<sub>2</sub> Standards is  $\geq 99\%$ (vol) ( $\geq 98\%$  for the stream captured from hydrogen production process at petroleum refinery)

\* In the future, when new capture technologies become commercially available, new standards will be determined on a technology-by-technology basis, considering energy penalty.

# **Monitoring Plan**

**(Ordinance of the MOE, Article 1-3)**

## **1. Monitoring under normal situation**

During normal operation (period other than the following two situations).

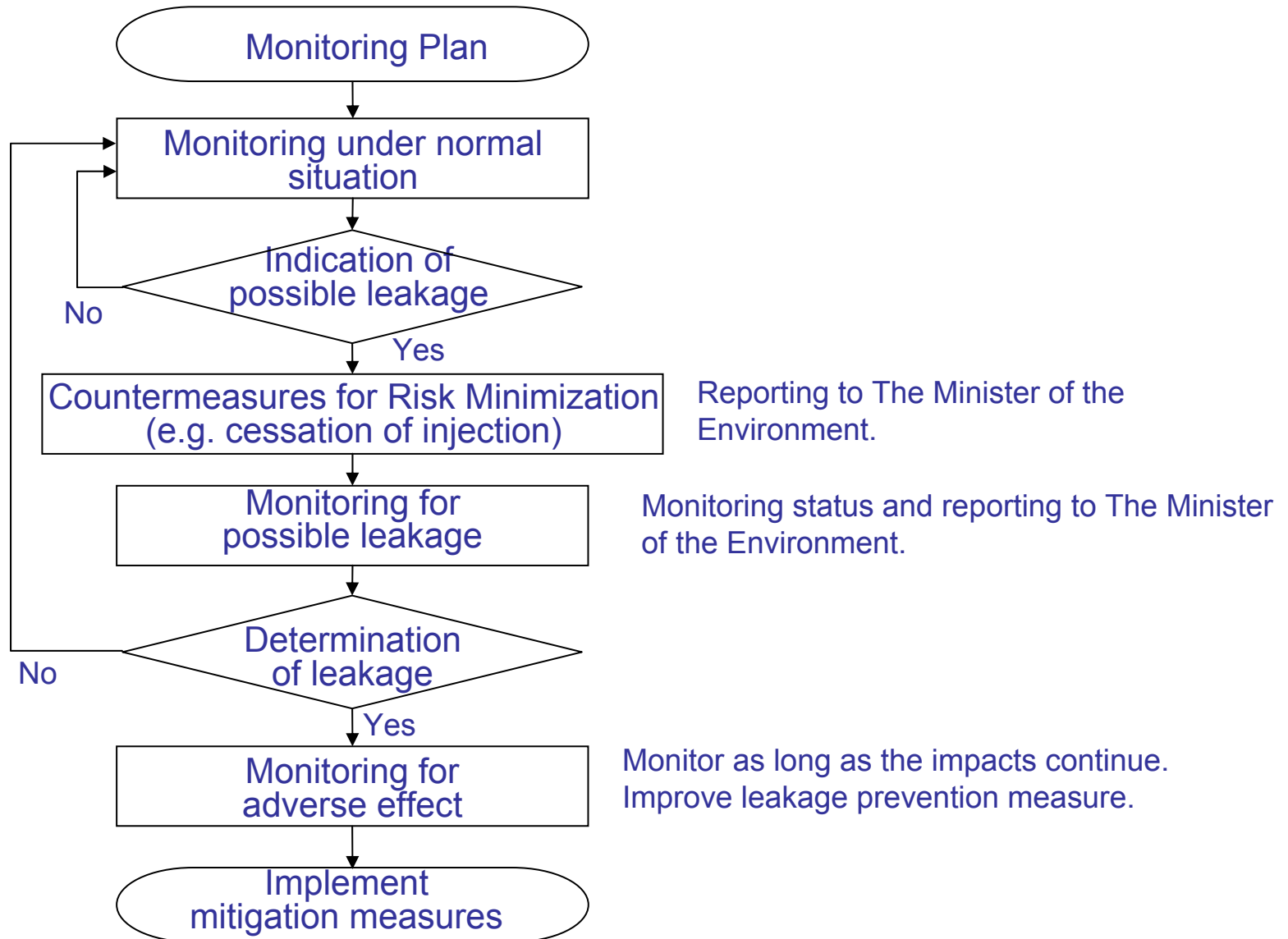
## **2. Monitoring for possible CO<sub>2</sub> leakage**

When there are possibilities of adverse effect on marine environment by CO<sub>2</sub> leakage, specific monitoring should be conducted to determine the existence of impact or evaluate its risk.

## **3. Monitoring for adverse impact in case of CO<sub>2</sub> leakage**

When adverse impact on marine environment by leakage exists or its risk is high, specific monitoring should be conducted.

# Concept of the Monitoring



# Comparison EU/JAPAN

	Item	EU (Oct. 7th)	Japan
1	Exploration permits	3 years	<i>No provisions</i>
2	Storage permits update	Every 5 years	Every 5 years
3	CO2 purity	95%	99% (Amine solvents)
4	Monitoring report	At least once a year	At least once a year (in principle)
5	CA's action in case of leakage	CA can take measures and recover the costs	<i>No provisions</i>
6	Requirements of Closure	Stated in Article 17	<i>No provisions</i>
7	Transfer of responsibility	To the CA after 50 years	<i>No provisions</i>
8	Registration for closed sites	Stated in Article 24	Stated in Article 18-5



みんなで止めよう温暖化  
キーム・マイナス6%

**Thank you.**