

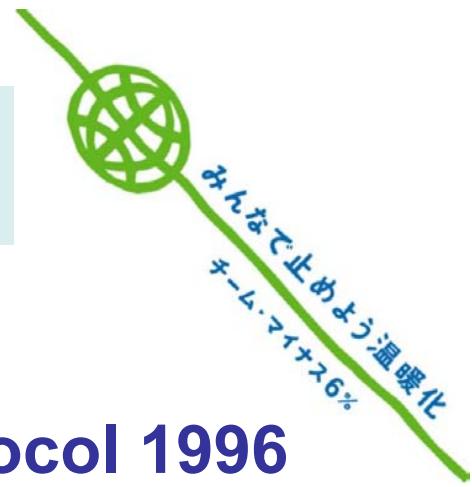


CCS Regulatory Development in Japan

Workshop on Sub-Seabed Carbon Dioxide Storage
Berlin, 16th June, 2008

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Outline



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*

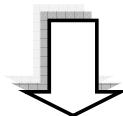
Amendments to the London Protocol 1996

- **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)

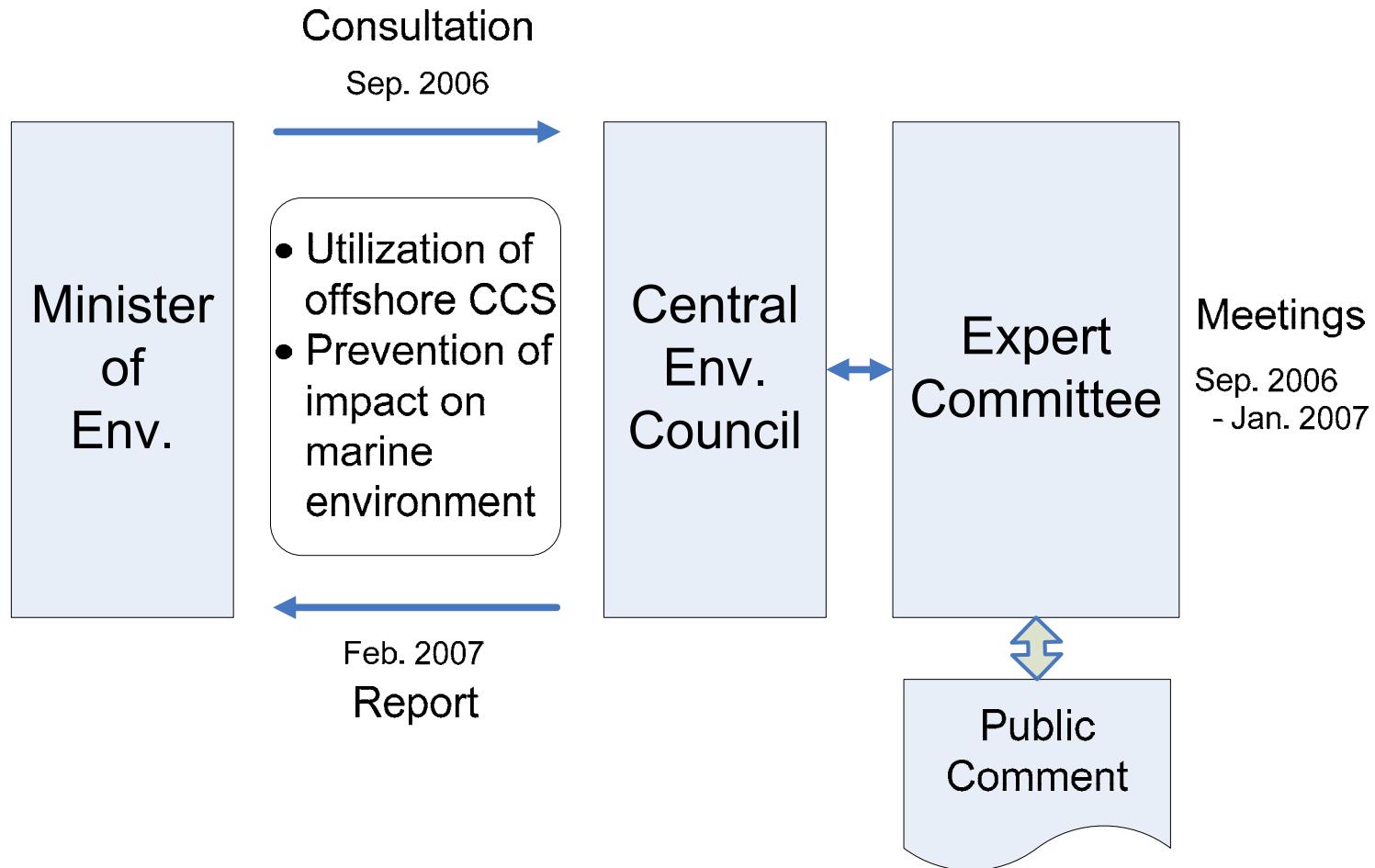
Marine Pollution Prevention Law:

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

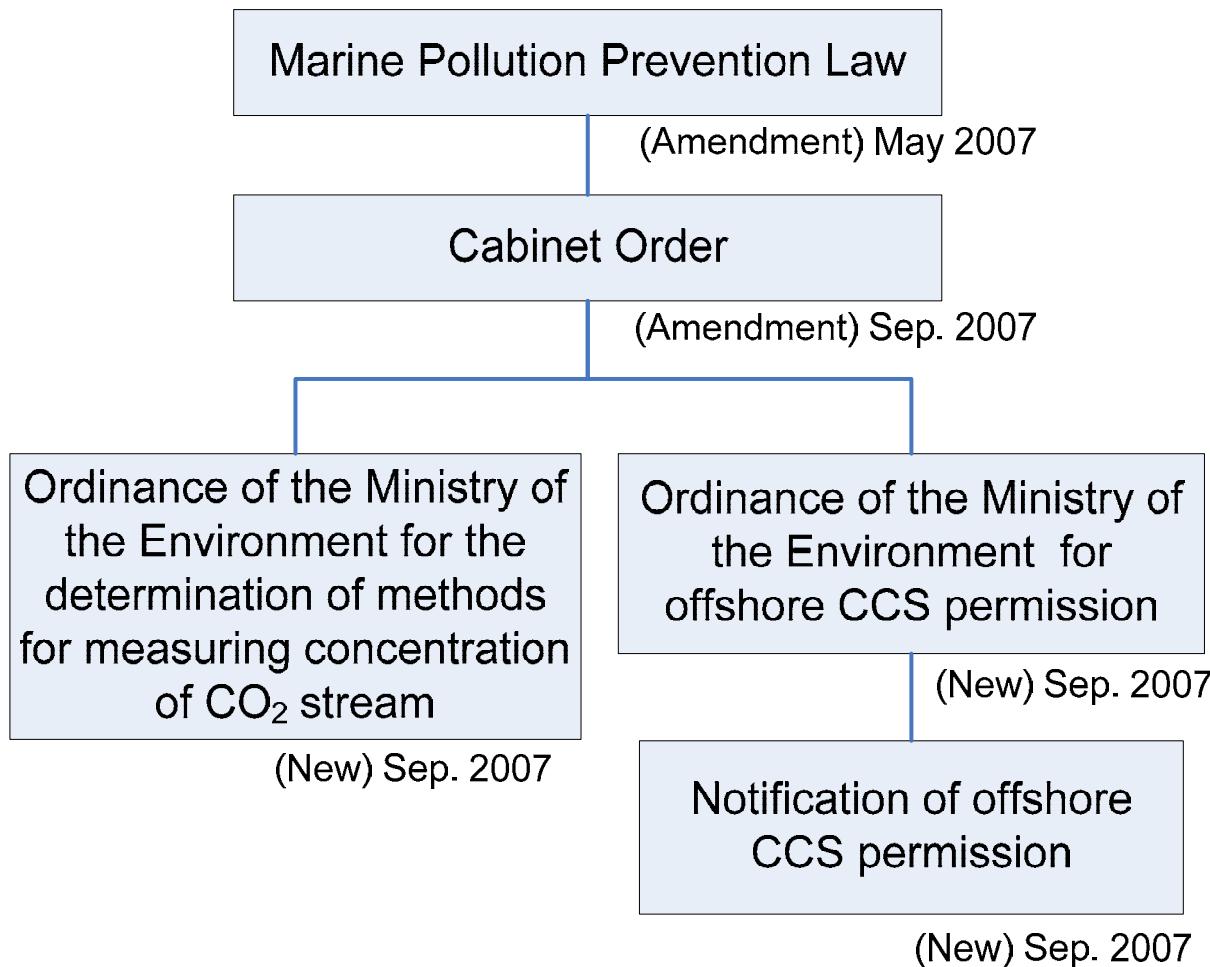


Amendment is required in accordance with LP amendment

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 CO₂ 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 CO₂ stream storage under the seabed

- (1) Anyone intending to dispose CO₂ 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 CO₂ 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 CO₂ 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 CO₂ storage site under the seabed as a **registered area**, in order to prevent potential impact on marine environment from CO₂ 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 CO₂ 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)

- CO₂ 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 CO₂ stream
- Amount of CO₂ stream to be stored
- Amount of CO₂ stream already stored
- Location and dimension of storage site
- Procedure for CO₂ 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 CO₂ stored under the seabed
- (3) Spatial extent of CO₂ stored within the sub-seabed geological formation, and estimated CO₂ 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 CO₂ leakage
- It is possible to monitor CO₂ storage and marine environment
- Mitigation measures can be taken in the area, in case of CO₂ 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 CO₂ Stream**
- (2) Location, spatial extent, and amount of potential CO₂ leakage**
- (3) Baseline data of marine environment at the storage site**
- (4) Evaluation of impact by potential CO₂ leakage**

CO₂ Purity Standards

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

CO₂ stream should consist overwhelmingly of CO₂ and meet the standards set by Cabinet Order

- CO₂ capture technology: Post combustion using amine solvents
- CO₂ purity: $\geq 99\%(\text{vol})^*$
 - * $\geq 98\%(\text{vol})$ for the stream captured from hydrogen production process at petroleum refinery
- No wastes or other matter are added

Background for Setting Current CO₂ Standards (1)

➤ Basis for the CO₂ concentration Standards

1. Higher concentration is desirable as a climate change mitigation option
2. Additional energy required for capturing more CO₂ should be considered

Table - 1

Technology		CO ₂ 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 ₂	NO	H ₂ S	H ₂	CO	CH ₄	N ₂ /Ar/O ₂	total
COAL FIRED PLANTS								
Post-combustion	<0.01	<0.01	0	0	0	0	0.01	0.01
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
GAS FIRED PLANTS								
Post-combustion	<0.01	<0.01	0	0	0	0	0.01	0.01
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 CO₂ with purity of $\geq 99\%(\text{vol})$
- $\geq 98\%(\text{vol})$ for the stream captured from hydrogen production process at petroleum refinery



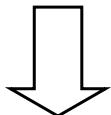
Standards for CO₂ concentration at the time of amendment:

1. Only consider the CO₂ capture technology using amine solvent*
2. CO₂ Standards is $\geq 99\%(\text{vol})$ ($\geq 98\%$ 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.

Background for Setting Current CO₂ Standards (2)

- Basis for the **impurity** standards
 1. Considered heavy metals and gaseous substances concentration (SOx, NOx, hydrogen sulphide, hydro carbon) using data from existing coal-fired power plant
 2. A simplified calculation showed that it is unlikely that there will be significant impact on the marine environment from heavy metals and gaseous substances in case of leakage



No need for quantitative Standards

Monitoring Plan

(Ordinance of the MOE, Article 1-3)

1. Monitoring under normal situation

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

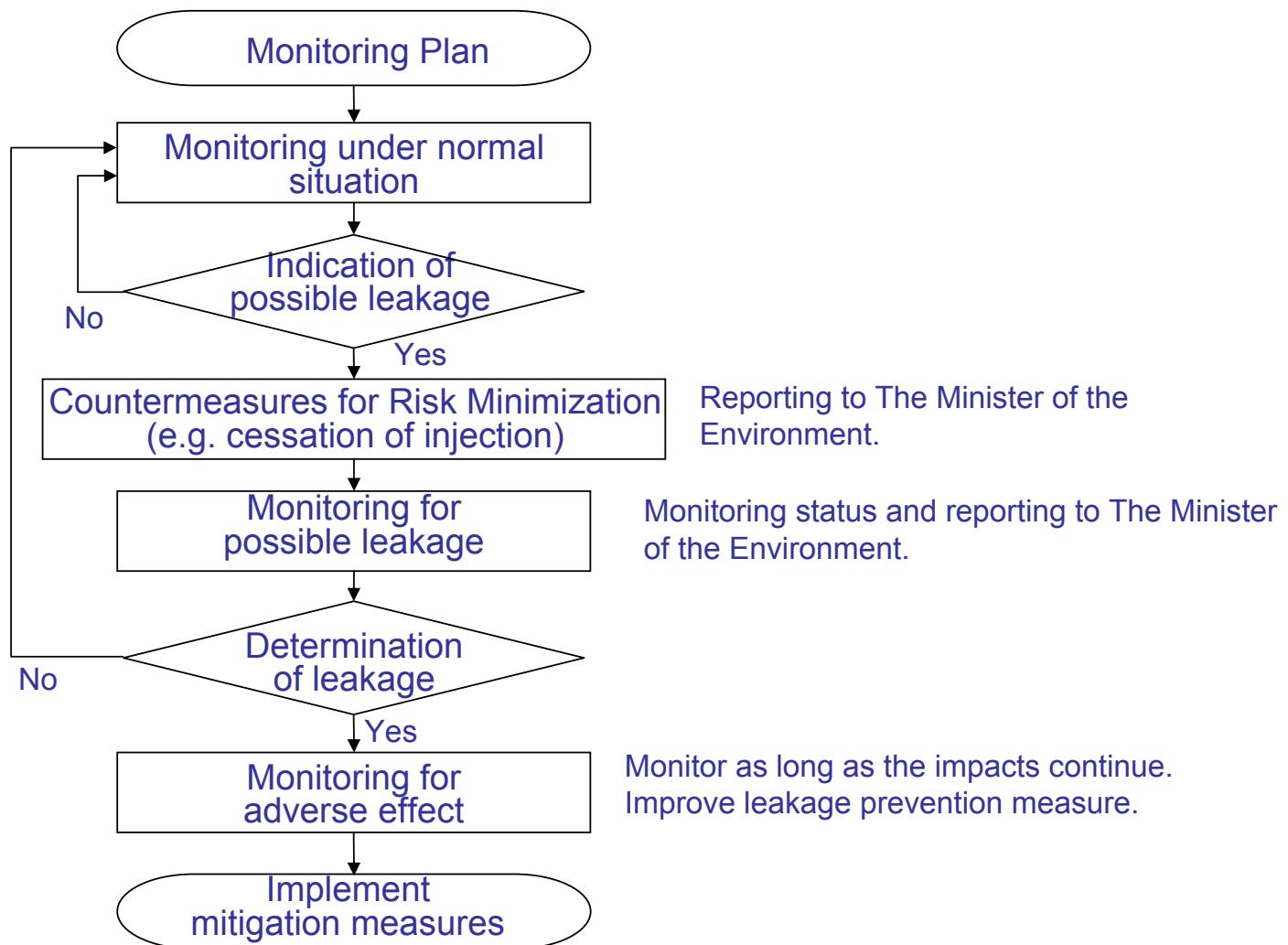
2. Monitoring for possible CO₂ leakage

When there are possibilities of adverse effect on marine environment by CO₂ leakage, specific monitoring should be conducted to determine the existence of impact or evaluate its risk.

3. Monitoring for adverse impact in case of CO₂ leakage

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

Concept of the Monitoring





Thank you.