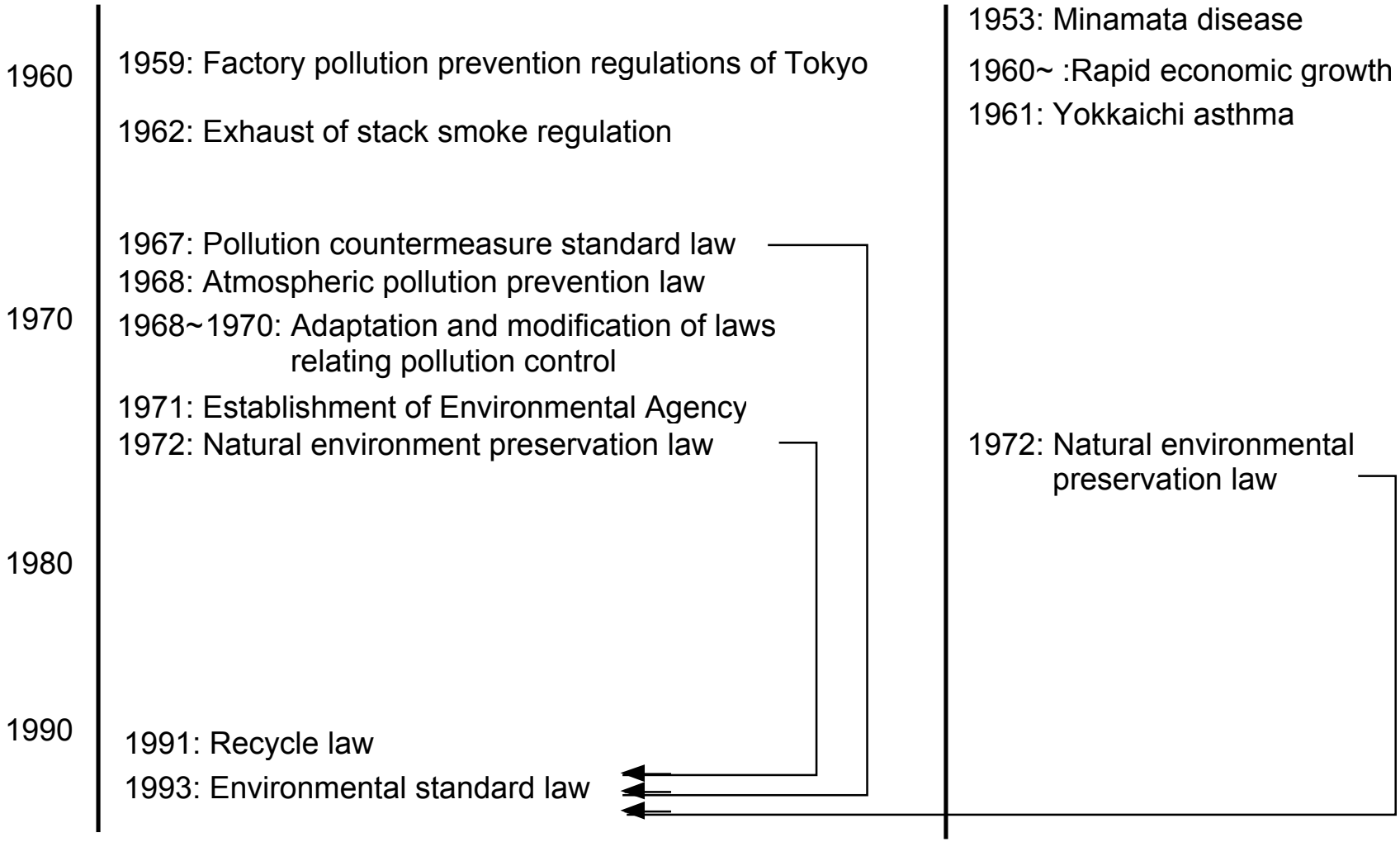
1. Environment Relating Laws in Japan



Japanese environmental laws transition

2. Atmospheric Pollutants Regulation in Japan

a. K-value-regulation

The **atmospheric pollution prevention law** of Japan defines the limit of the stack exhaust mass or gas density called **exhaust standard**. The limitation for the **SO_2 emission** of specific factory/plant is defined as:

$$q = K\,10^{-3}\,He^2 \quad ,$$

where, q: mass of sulfur oxides, K: regulation table value defined in the law, He: effective stack height. This regulation is called "K value regulation."

b. total regulation

For the case that the **K-value-regulation is insufficient** such as for an industrial area where factories are settled thickly and the **environmental standard** is not satisfied, the **total regulation** is applied. The total-regulation limits the emission based on the summed up emission from the target area. This law regulates sulfur oxides and nitrogen oxides. Each emission is controlled from the estimated atmospheric density using the **diffusion equation**.

3. Environment Assessment and the Power Plant

In 1970's the understanding for the environment pollution problems was "not local problem" but,

- pollution problem becomes regional, and sometimes global phenomenon
- environmental problems which relating residential lives are not solved by conventional restrictive laws

USA effectuated "National Environmental Policy Act, NEPA" in 1970, and the law defined the environmental assessment for the plan that the government supports the fund (such as hi-way construction) and for the plan that the government has the authorization rights (such as power-plant construction). In Japan, the MITI (Ministry of International Trading and Industry) defined the administrative guides for the power plant in 1977.

In 1993, Japanese government integrate the relating laws and effectuated "Environment Fundamental Law."

NOTE: The administrative guides of the MITI are not restrictive, however, it produced effective action plan among the large industries.

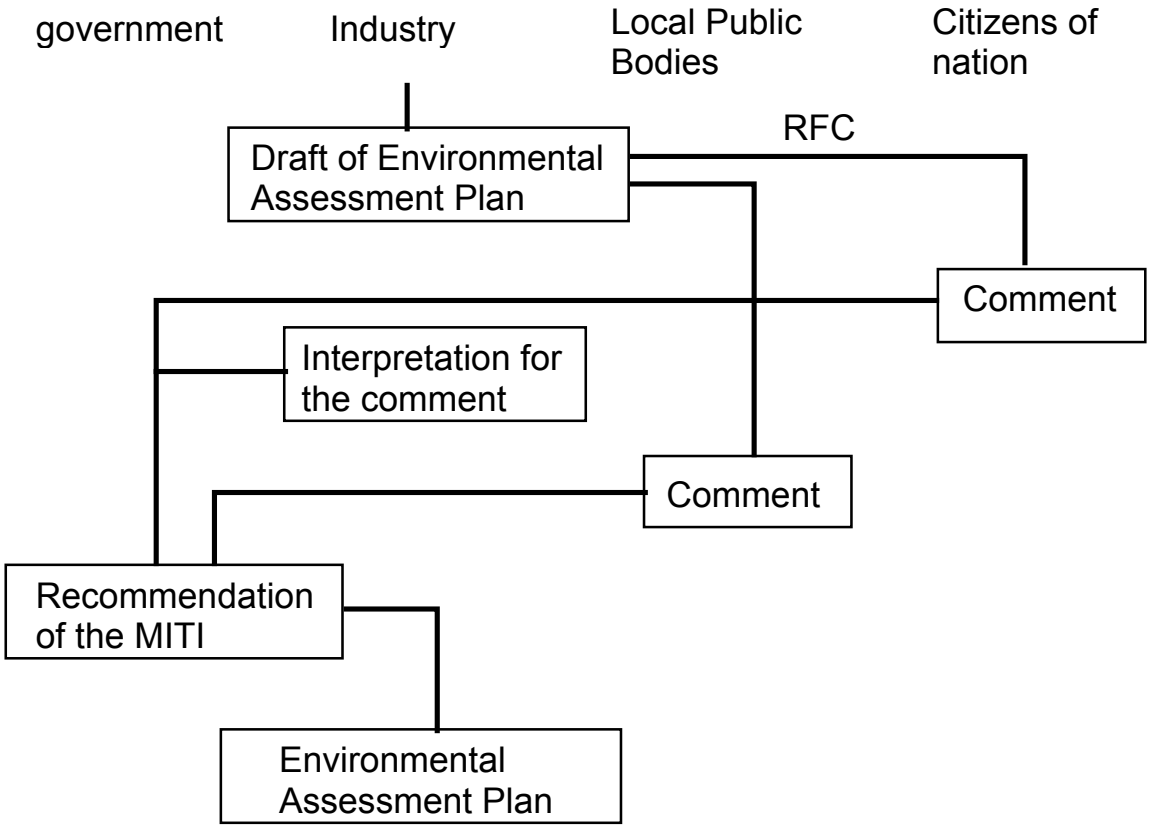
4. Procedure of the Environmental Assessment for the Power Plant

a. Screening for the Assessment

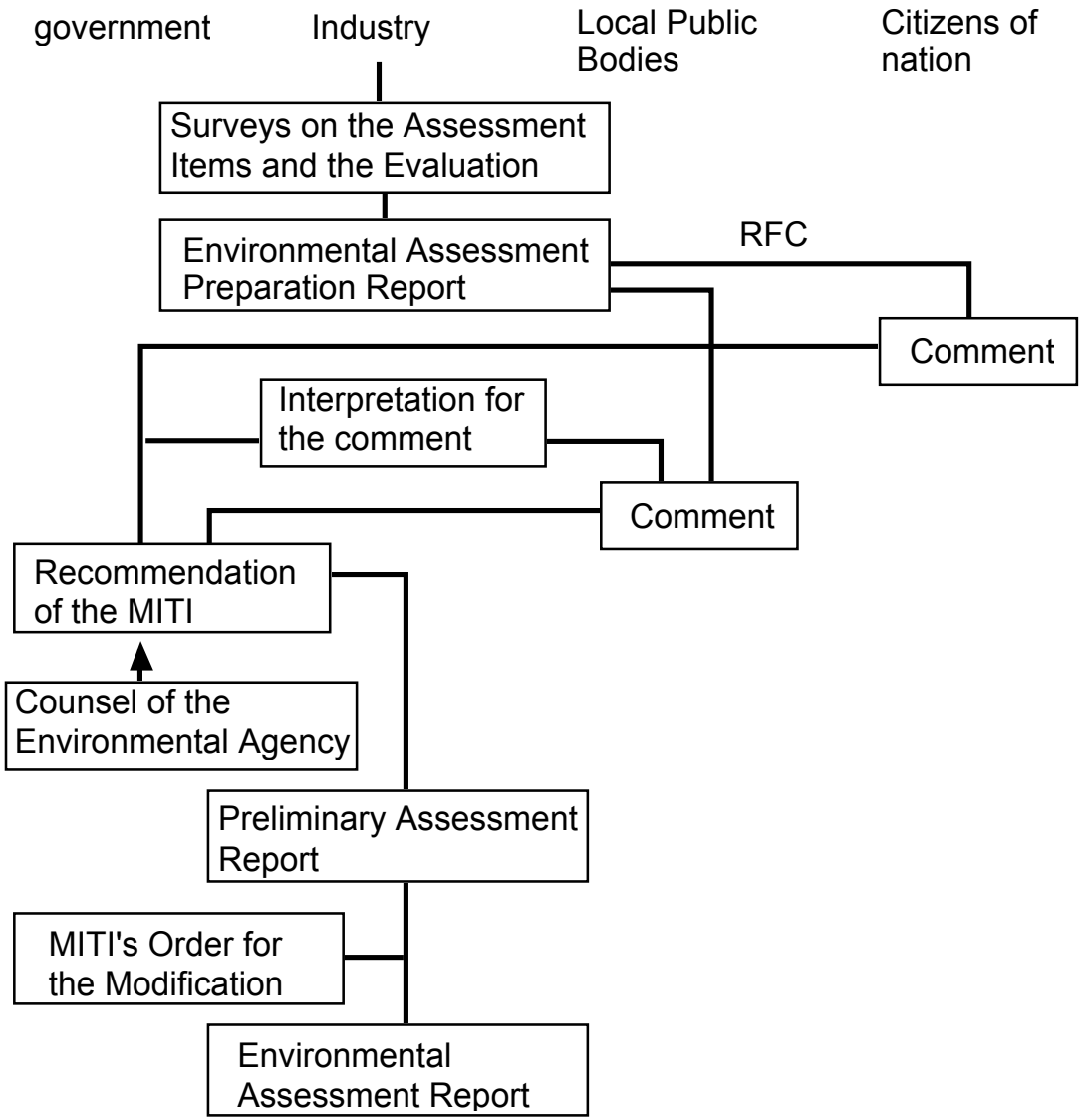
Power Plant Type	Class-I Plant	Class-II Plant
Hydroelectric	> 30 MW	22.5 ~ 30 MW
Thermal	> 150 MW	11.25 ~ 150 MW
Subterranean heat	>1 MW	0.75 ~ 1 MW
Nuclear	all	-
	Obliged for the assessment	Obligation is conditional

b. Scoping for the Assessment

An assessment is started with the "Environmental Assessment Plan" which will be adapted for the characteristics of the power plant type and of the base region. The assessment items/methods are accommodated based on the standards.



c. Assessment Report



Before the completion of the assessment report, the industry must prepare the "**Environmental Assessment Preparation Report**." The report will present environmental assessment methods and results with all comments/ interpretation for the comments and recommendations. The industry requests for comments on this preparation report. Following the comments, the industry prepare the "Environmental Assessment Report." If necessary, the government order the modification of the report.

d. Assessment Items

Assessment items and methods are standardized in the manual published by the government. The standardized items for the thermal and nuclear power plants are:

Purpose	Category	Survey Item
Environmental Quality Control	Atmospheric Quality	SOx
		NOx
		Suspended Particulate Matter
		Dust
		Coal Dust
	Noise	Noise
	Vibration	Vibration
Amenity for the Citizens	Site View	Site View
Environmental Load Control	Waste	Solid Waste
	Greenhouse Gases	CO_2

e. Assessment Methods

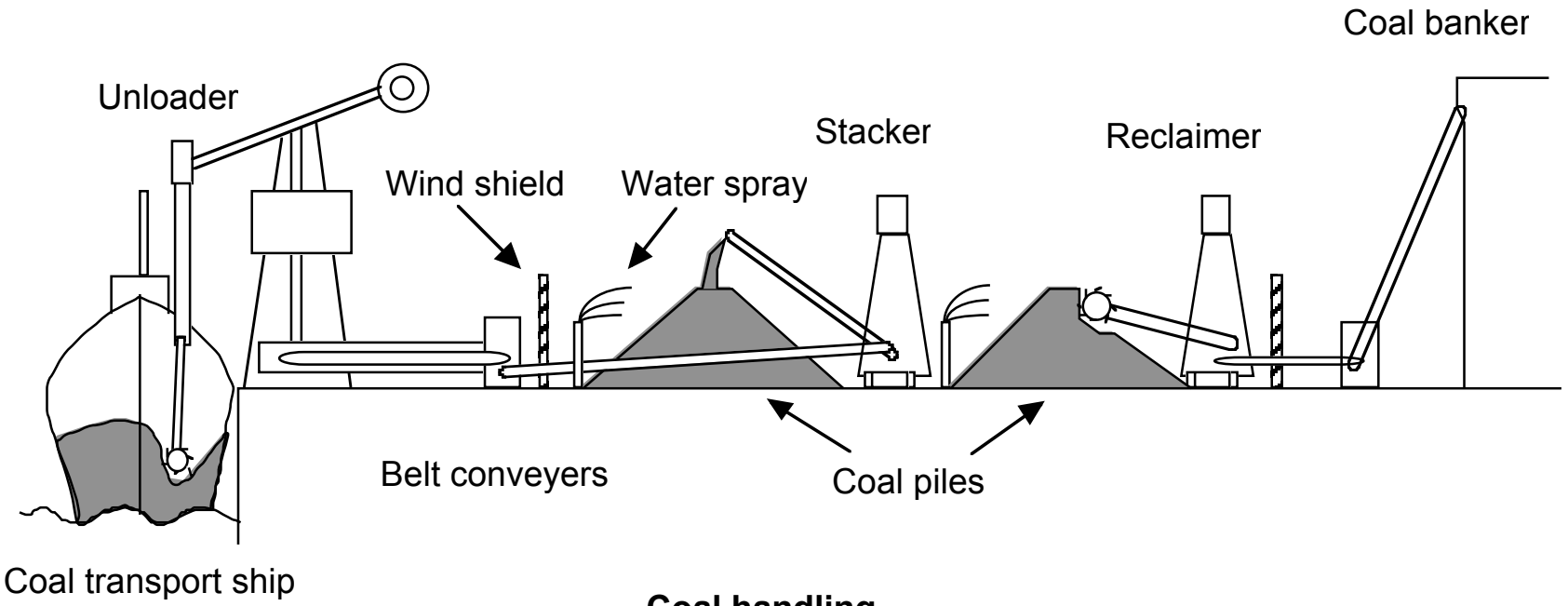
The assessment standardized methods for the Sulfur Oxide relating the thermal power plants are:

Survey/ Estimation Items		Observation Items
Observation of the data	SO2 density	Atmospheric density of the plant adjacent area
	Meteorological conditions	Surface meteorological parameters: wind direction, wind speed, insolation, radiation budget Upper meteorological parameters: wind direction, wind speed, temperature
Data survey method	Existing data surveys	SO2 density: government/local public observation station data Meteorological data: existing data
	Data observation method	SO2 density: solution conductivity method Meteorological data: meteorological observation guideline
Observation area	SO2 density	An area within the radius of 20 km centered the plant
Observation points	SO2 density	10 observation points
	Meteorological conditions	1 point in the plant site or in the adjacent area
Observation term		1 year
Estimation method	Estimation method of one year average value	Equation: Plume rise calculation and diffusion equation should be follow the governmental guideline Estimation conditions: Meteorological parameters of the site
	Estimation method of one day average value	ditto
	Topographical effect	Evaluation using a wind tunnel experiment or a numerical model
Estimation area		Area where exhausted gas density is relatively high using one year ave.
Time to estimate		Time when the plant in stable operation state

f. Coal dust diffusion assessment

At the coal combustion power plant, coal handling facilities have the possibilities to disperse the coal dusts, such as coal piles, unloader, stacker, reclaimer, conveyers. The coal dust diffusion is estimated as following steps:

- to evaluate the points where coal dispersion occurs
- to obtain the data of handling coal mass, handling period, coal moisture, and the height for each point
- to evaluate the wind speed and direction for each point
- to evaluate dust density using the diffusion equation applying slanting the center of the plume considering the sedimentation of the dust particles



Coal handling