

Air Pollution Control Policy in Japan for Mitigating Sulphur Emission

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Outline

I. Introduction of Japan

II. Measures

- Air Pollution Control Law
- Environmental Impact Assessment Law

III. Emission and Air Quality in Japan



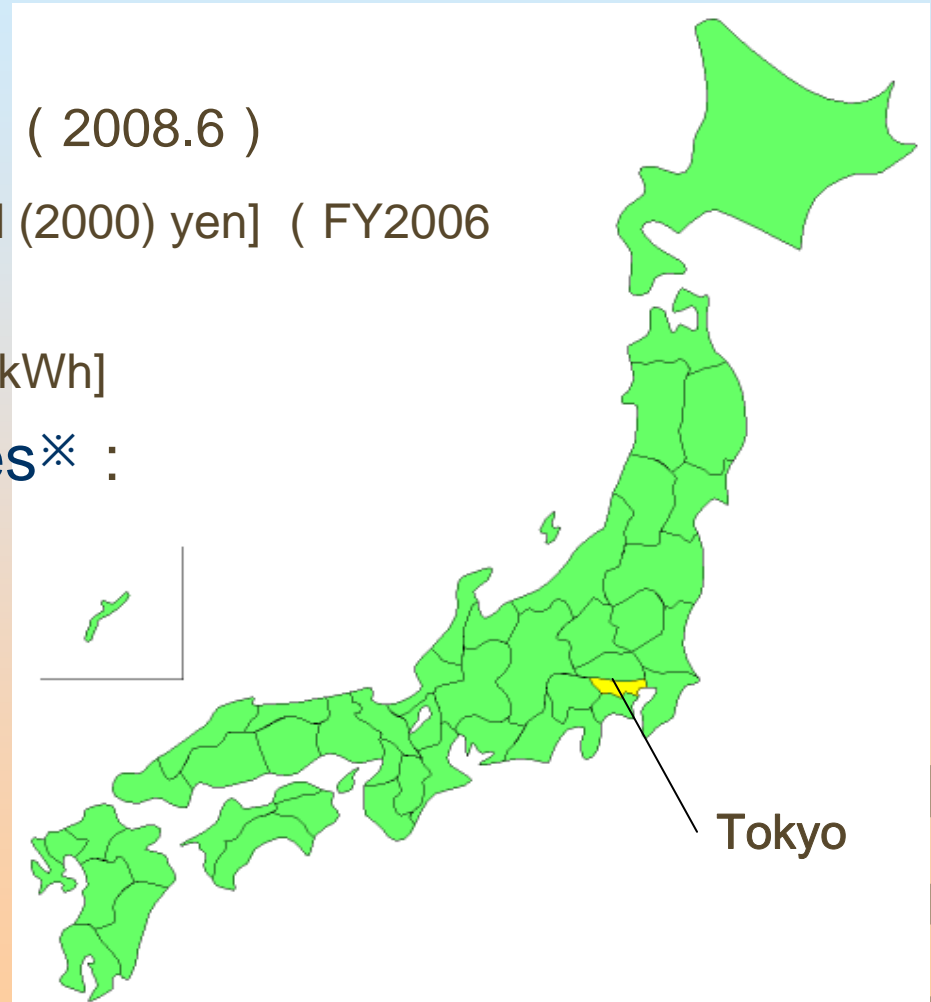
I. Introduction of Japan



Introduction of Japan

⚙ About Japan

- Population : 127.684 [million] (2008.6)
- GDP : 533,854 [billions of chained (2000) yen] (FY2006)
- Power Energy※ : 970.5 [trillion kWh]
- Composition of Power Sources※ :
 - Thermal Power : 60.4%
 - Coal : 24.7%
 - LNG : 25.7%
 - Oil : 8.2%
 - LPG, Geothermal etc. : 1.8%
 - Nuclear Power : 29.1%
 - Water Power : 10.0%
 - New Energy : 0.5%



※2005.3, Agency for Natural Resources and Energy

II. Measures



Laws related to Air Pollution

The Basic Environment Law

Environmental Quality Standards

Air Pollution Control Law

- ✓ Soot and Smoke (SO_x, NO_x etc.)
- ✓ Dust (General dust, Asbestos)
- ✓ Volatile Organic Compounds (VOCs)
- ✓ Hazardous Air Pollutants (HAPs)

Automobile NO_x/PM Law

- ✓ NO_x, PM

Dioxins Control Law

- ✓ Dioxins

Environmental Impact Assessment Law

Pollution-related Health Damage Compensation Law

Stationary Sources

Mobile Sources

(Natural Sources)

Power Plants, Roads etc.

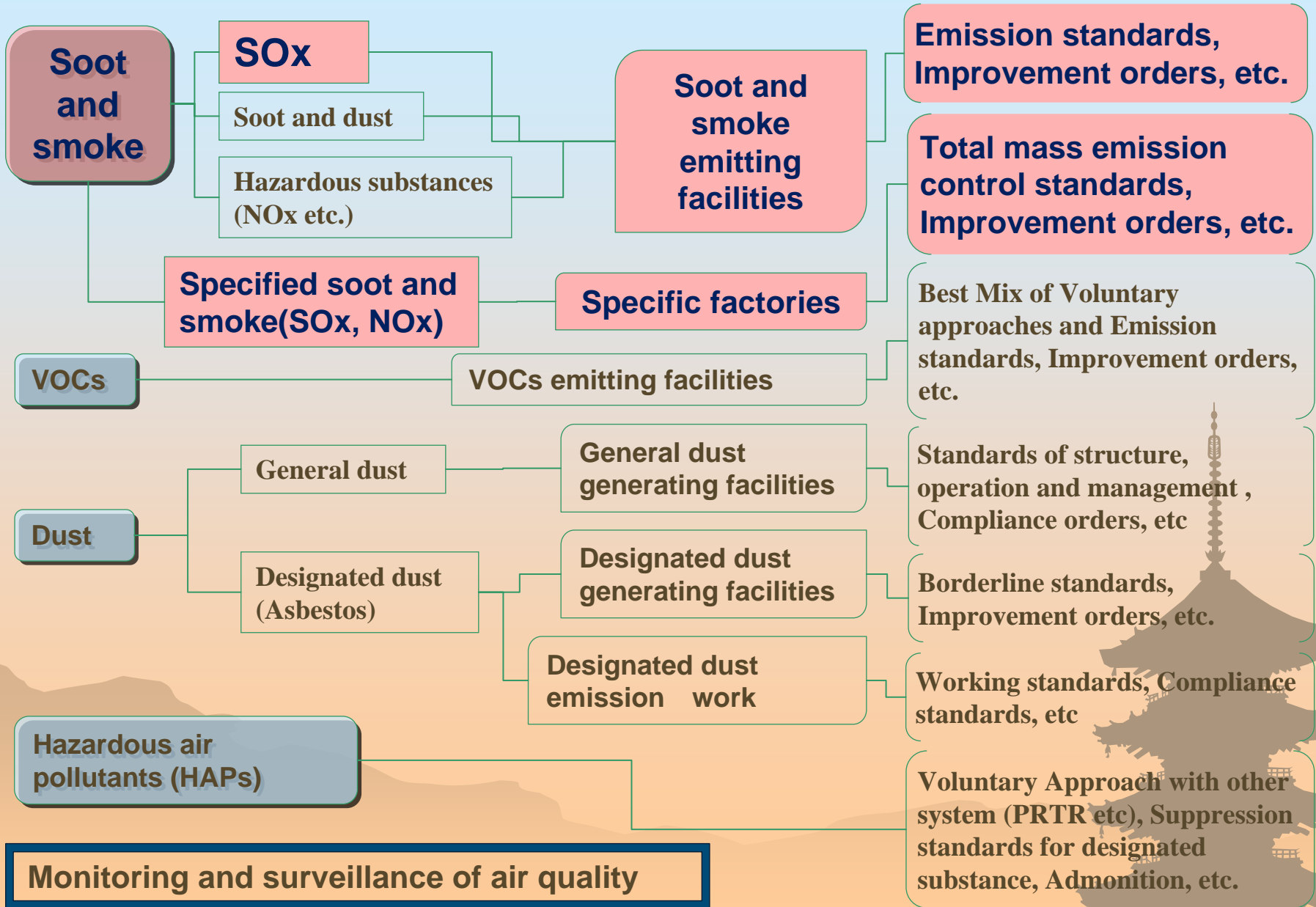
Atmospheric Environmental Quality Standards

Major air pollutants

Substance	Environmental conditions	
SO ₂ (Sulfur dioxide)	Daily average 0.04 ppm	Hourly values 0.1 ppm
CO (Carbon monoxide)	Daily average 10 ppm	Average of hourly values for any consecutive eight hour period 20 ppm
SPM (Suspended Particulate Matter)	Daily average 0.10 mg/m ³	Hourly values 0.20 mg/m ³
Ox (Photochemical oxidants)	-	Hourly values 0.06 ppm
NO ₂ (Nitrogen dioxide)	Daily average 0.04-0.06 ppm	-

- Suspended particulate matter is defined as airborne particles of a diameter smaller than or equal to 10 µm.
- Photochemical oxidants are oxidizing substances such as ozone and peroxyacetyl nitrate produced by photochemical reactions (only those capable of isolating iodine from neutral potassium iodide, excluding nitrogen dioxide.)

Air Pollution Control Law



SO_x Emission Standard (K-value)

- General emission standard (Uniformly applied throughout the country)
- SO_x emission limit depending on effective stack height is set so that maximum ground concentration of SO_x from specified facilities keep below a certain value.
- The lower K-value depending on area, the more stringent the emission standards.

<Formula of SO_x emission standard>

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

q : Emission limit (mass of SO_x, Nm³/h)

K : The constant value (depending on region: 3.0 - 17.5)

He : Effective stack height

(Factor calculated based on the rising momentum of exhaust gas)

SO_x Emission Standards (Special Emission Standards)

⚙ Special Emission Standards

➤ Stringent emission standards

- Applied to the facility established in the area or a part thereof where such emitting facilities are concentrated
- Air is liable to be severely polluted by SO_x emitted by these facilities to an extent exceeding the limits✘

✘ One-day mean value is 0.04 ppm for more than seven days a year.

- K-value of special emission standards is smaller than general emission standards (K = 1.17 - 2.34). i.e. Stringent!

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

q : Emission limit (mass of SO_x)

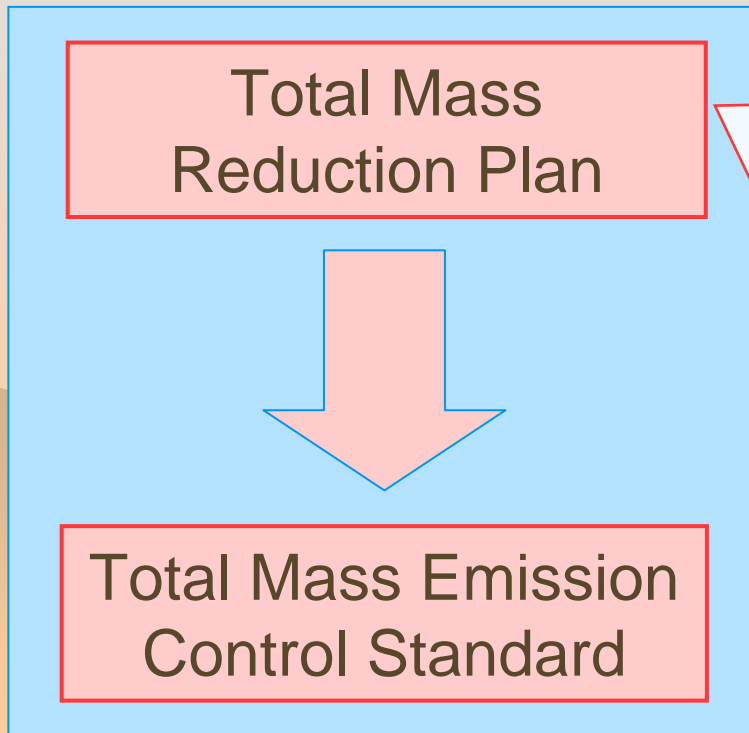
K : The constant value (generally: 3.0 - 17.5)

He : Effective stack height

Total Mass Emission Control Standard

❁ Total Mass Emission Control Standard

- Standard applied to large-scale plants in specified area where attainment of air quality standard is difficult by the standard in each facility (i.e. general emission standard / special emission standard)
- Standard to attain the reduction in the total mass reduction plan



1. Total mass of SO_x emitted by the business activities and other activities of people
2. Total mass of SO_x emitted from the facilities installed at all specific plants
3. Total mass of SO_x emission to achieve air quality standard for SO₂
4. Emission control standard relating to the total mass emission referred to in Item 2 above.
5. Period and method to attain the plan.

Total Mass Emission Control Standard

Either Fuel Use Formula or Ground Concentration Formula

⚙ Fuel Use Formula

$$Q = a \cdot W^b$$

Q : Emission limit (Nm³/h)

W : Amount of fuel consumed at all soot and smoke emitting facilities installed a specified plant (kL/h, converted into heavy oil)

a : Constant determined by prefectural governor to be attained reduction target on emission

b : Constant determined by prefectural governor in the range from 0.80 to below 1.0

⚙ Ground Concentration Formula

$$Q = (C_m / C_{m0}) \cdot Q_0$$

Q : Emission limit (Nm³/h)

Q₀ : (Current) Mass of SO_x emitted from all soot and smoke emitting facilities installed a specified plant (Nm³/h)

C_m : Maximum polymerized ground concentration determined by the prefectural governor to attain reduction target (ppm)

C_{m0} : Maximum polymerized ground concentration relating to Q₀ (ppm)

Environmental Impact Assessment Law

General Public

Governor

Mayor

Project Undertaker

National Government
Relevant Ministers

Screening

Class2 Project

Work Plan

Views

Class1 Project

EIA

Decision

No EIA

Scoping

Views

Proposed Scoping Document

Views

Finalized Scoping Document

Subject to
Local EIA System

Conducting of EIA

Survey, Forecast and Evaluation

Draft and Final EIS

Views

Draft EIS

View of Environment
Minister

Views

EIS

View of Relevant
Minister

Supplementing of EIS

Follow-up of EIA

Construction of the Project

Environmental Protection Measures, Surveys

Examination at
Licensing, etc.

Environmental Impact Assessment (EIA) of Power Plants

❁ Category and scale subject to the EIA Law

- Hydraulic power plant (large-scale)
- Thermal power plant (large-scale)
- Geothermal power plant (large-scale)
- Nuclear power plant (all)

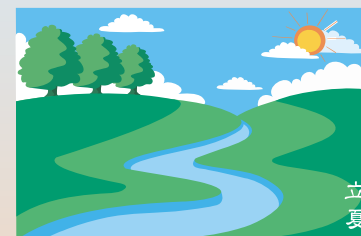


❁ Assessments of power plants completed in 2004-2008

- Natural gas-fired power plants: 8
- Coal-fired power plants: 3 (1 withdrawn)

Environmental Factors

Environmental Factors		
Components of the Environment	Air	Air quality
		Soil
		Vibration
		Odor
		Others
	Water	Water quality
		Sediments
		Groundwater
		Others
	Soil and Others	Geology
		Ground
		Soil
Others		
Biodiversity and Natural Environment	Fauna	
	Flora	
	Ecosystem	
Contacts between People and Nature	Scenery	
	Areas of contacts	
Environmental Loads	Wastes	
	Greenhouse gases	



EIA on Air Pollutants from Power Plants

(Evaluation and review of emission level)

1. Whether the best effort is made to minimize the effects (emission) (e.g. introduction of BAT)
 - (ex.) Combustion technology
 - Technology of equipments for desulphurization and denitration
 - Height of chimneys
2. Whether the targets set by the national or local government can be achieved around the plant
 - National level: Environmental Quality Standards
 - Local level: e.g. Local environment management plan
 - The concept of evaluation and review in EIA is the same for all the environmental elements (e.g. air, water, noise, etc.)
 - The targets in addition to emission standard under Air Pollution Control Law

Planned Emission Level of Air Pollutants in the (D)EISs of Coal-Fired Power Plants

Purpose of Power Plants	EIS	Year*	Capacity	S O x	N O x	Soot
Industrial use	Draft	2008	300MW	10 ppm	20 ppm	5 mg/m ³
Provision to Large Scale Users	Draft	2008	200	24	24	7
Industrial use	Final	2006	220	14	17	5
Provision to Large Scale Users	Draft	2005	500	15	20	8
Industrial use	Final	2005	150	35	35	10
Industrial use	Final	2002	507	25	15	5
Public use	Final	2000	1000	42	36	10
Public use	Final	1999	600	24	24	7

*Year when the (Draft) Environmental Impact Statement ((D)EIS) is submitted

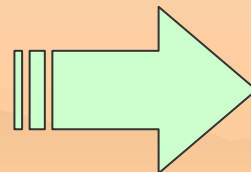
III. Emission of SO_x and Air Quality in Japan



Polluted 1960s



Present

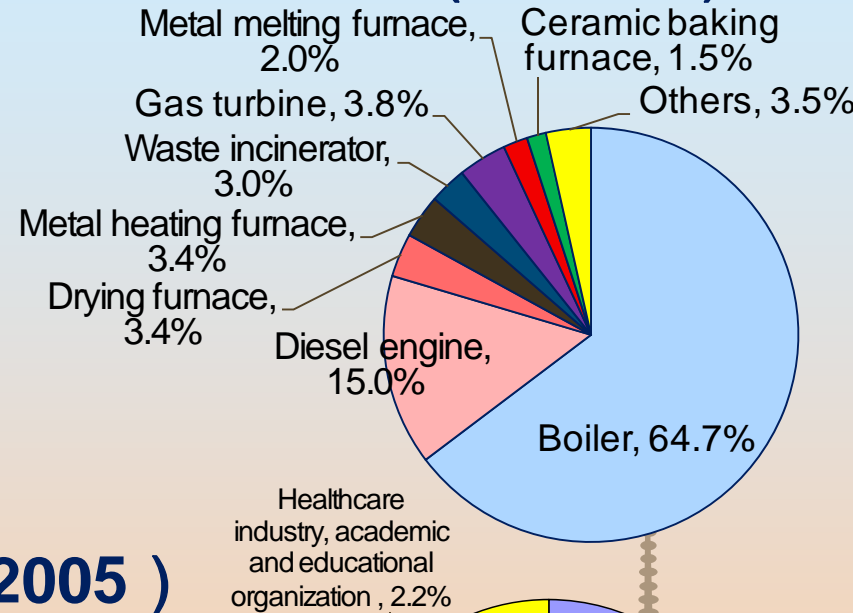


Example of Kita-kyusyu city area (Industrial complex)

Number of Specified Facilities and Emission Inventory

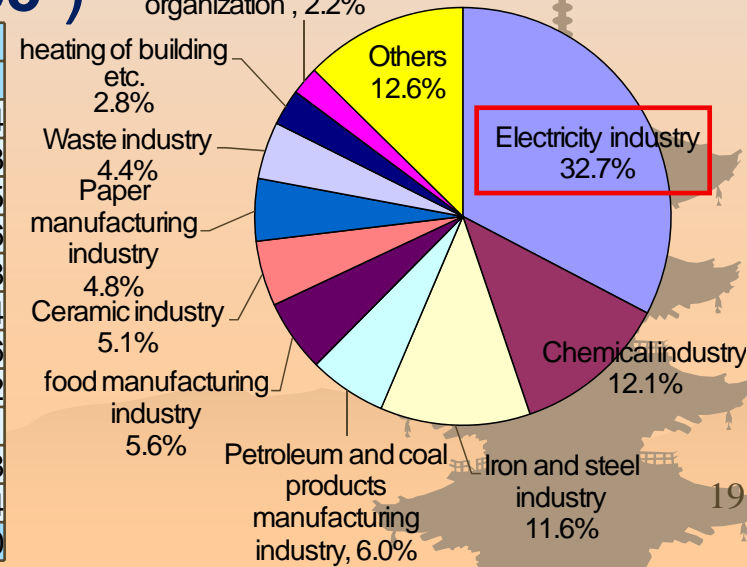
Number of soot and smoke emission facilities (2006.3)

Facility name	Number of facilities	Rate
Boiler	141,466	64.7%
Diesel engine	32,608	14.9%
Drying furnace	7,371	3.4%
Metal heating furnace	7,478	3.4%
Waste incinerator	6,391	2.9%
Gas turbine	8,196	3.8%
Metal melting furnace	4,242	1.9%
Ceramic baking furnace	3,163	1.5%
Others	7,599	3.5%
Total	218,514	100%



Emission Inventory of SOx (FY2005)

Category of industry	Emission Mass ($\text{Km}^3_{\text{N}}/\text{year}$)
	Electricity industry
Chemical industry	24,003
Iron and steel industry	23,075
Petroleum and coal products manufacturing industry	11,926
Food manufacturing industry	11,098
Ceramic industry	10,064
Paper manufacturing industry	9,616
Waste industry	8,802
Heating of building etc.	5,581
Healthcare industry, academic and educational organization	4,338
Others	25,044
Total	198,370

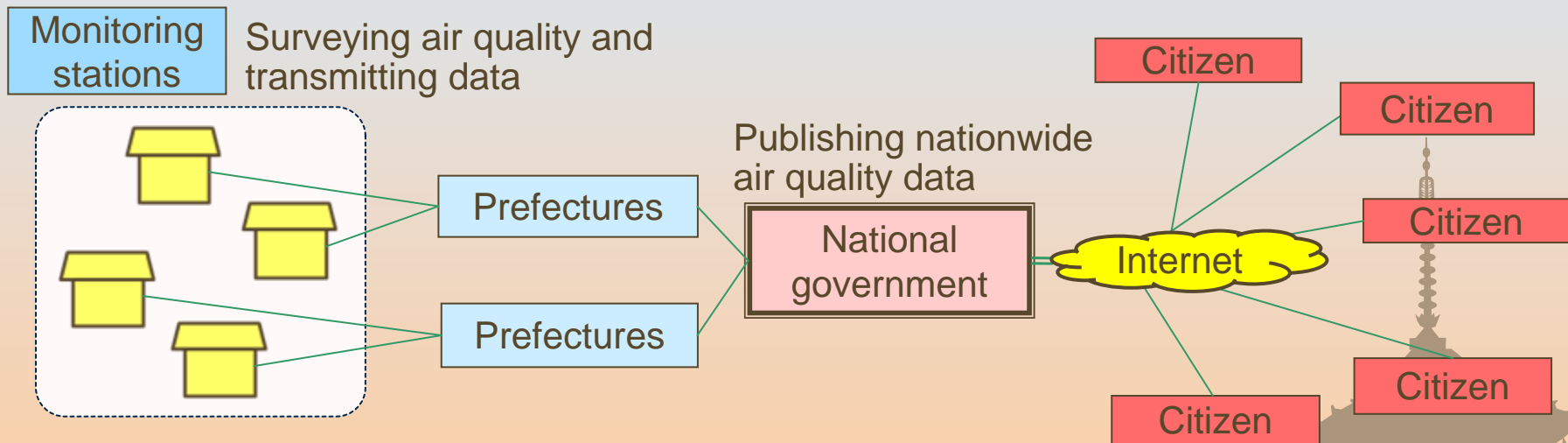


Air Quality Monitoring

⚙️ Purpose

- To grasp the state of air pollution in regions, state of air pollutant sources and heavily-polluted areas and impact of antipollution measure
- To serve as a baseline of measures to prevent air pollution by grasping trends in nationwide air pollution, annual trends, etc.

⚙️ Monitoring System



⚙️ Type of Monitoring Stations (2,006 stations in 2007)

- Ambient Air Quality Monitoring Stations (AAQMS)

Station in residential area except RAQMS

- Roadside Air Quality Monitoring Stations (RAQMS)

Stations in order to monitor air quality near cross-sections, roads and roadsides

Online Monitoring Data

2008年11月27日01時～2008年12月04日08時の測定時報値地図および時報値表がご覧になれます。
過去7日間の時報値は測定局一覧からご覧下さい。

表示項目を選択する

- 二酸化硫黄(SO2) 表示項目の詳細
- 一酸化窒素(NO)
- 二酸化窒素(NO2)
- 光化学オキシダント(OX)
- 非メタン炭化水素(NMHC)
- 浮遊粒子状物質(SPM)
- 風向・風速(WD・WS)
- 気温(TEMP)

測定局種別を選択する

一般局

表示日時を選択する

2008年12月4日8時



表示地域を選択する

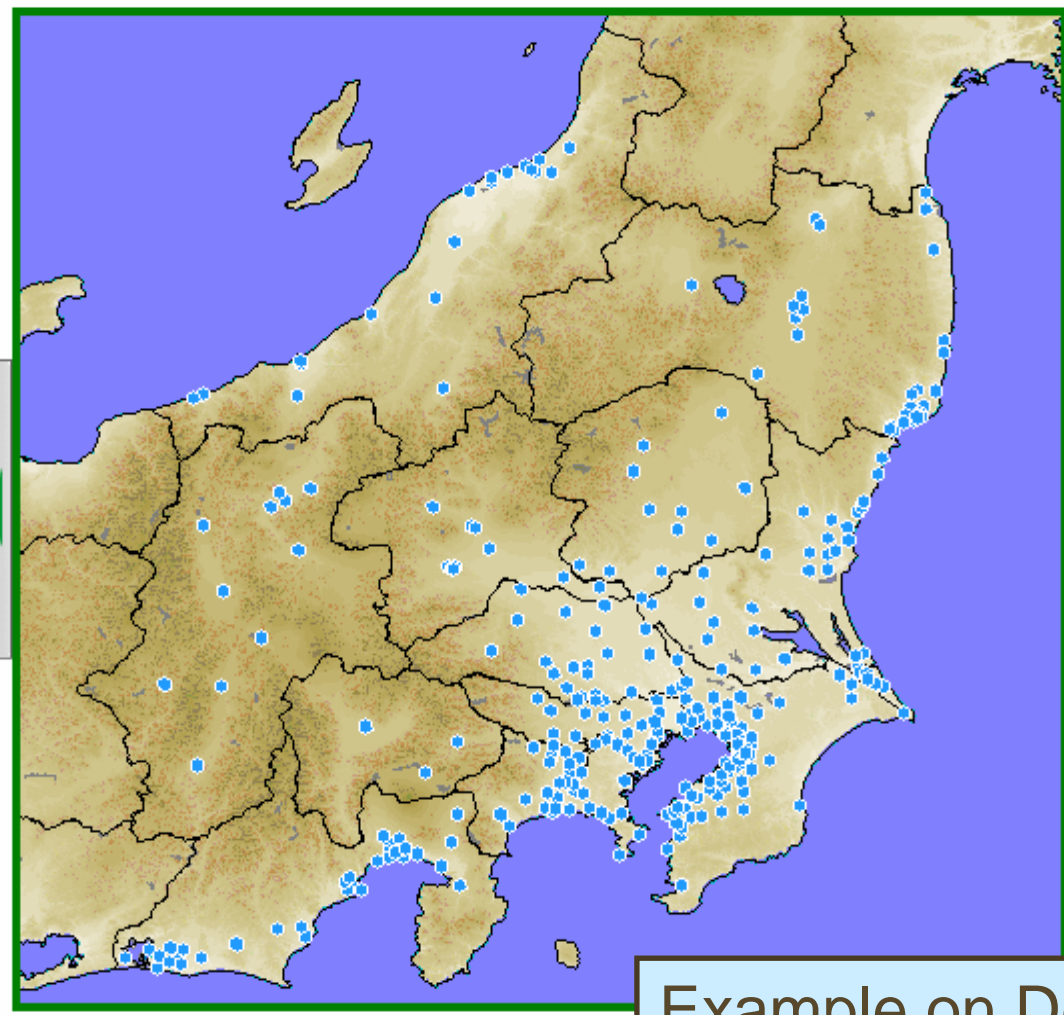
首都圏

表を見る



時報値表

測定時報値地図



凡例

S02濃度

○	: 一般局	□	: 自排局
Blue	: 0.000~0.020 (ppm)		
Cyan	: 0.021~0.040 (ppm)		
Green	: 0.041~0.100 (ppm)		
Yellow	: 0.101~0.120 (ppm)		
Orange	: 0.121~0.150 (ppm)		
Red	: 0.151~ (ppm)		

測定局種別

一般局

地域

関東

日時

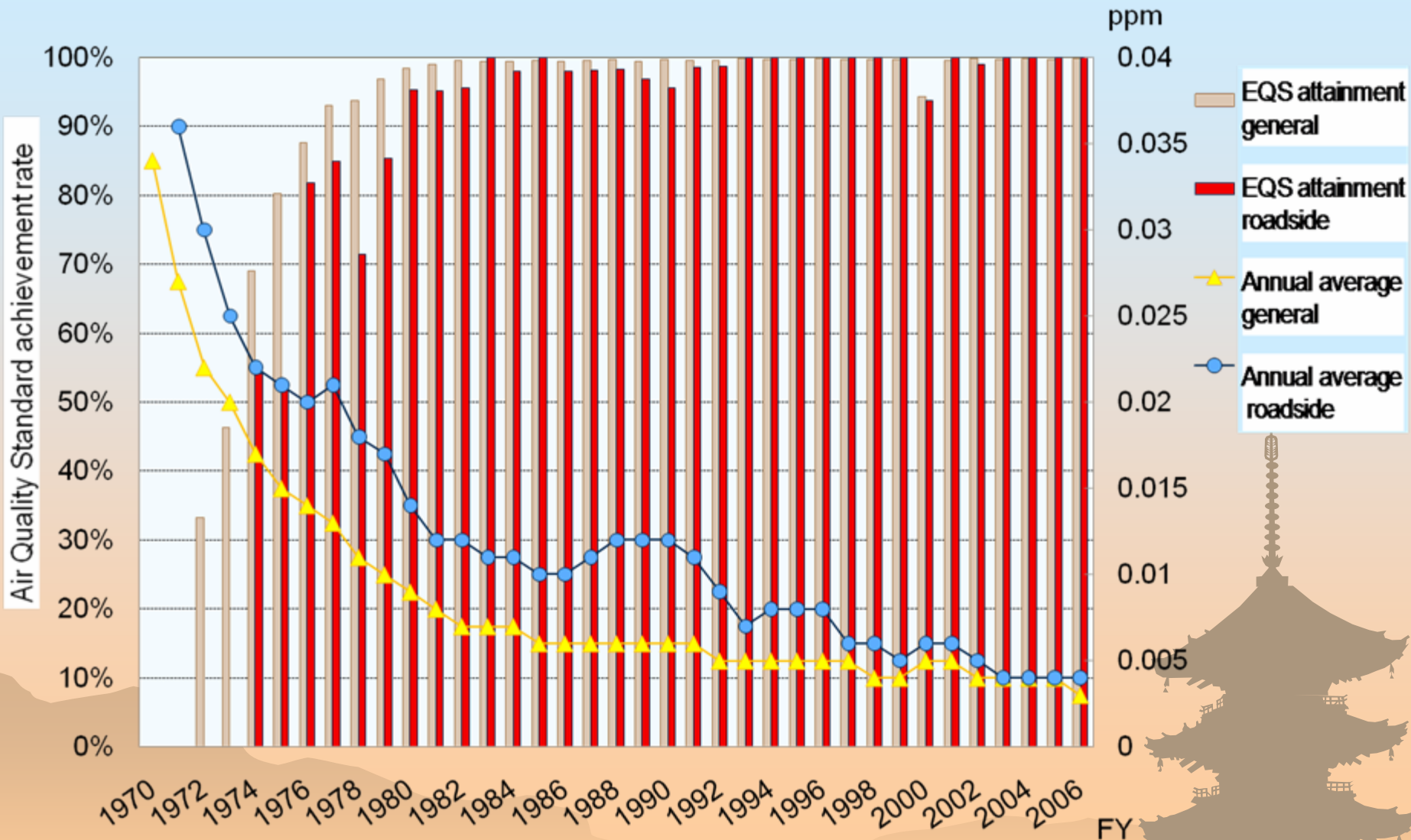
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別ウィンドウで表示

首都圏を表示

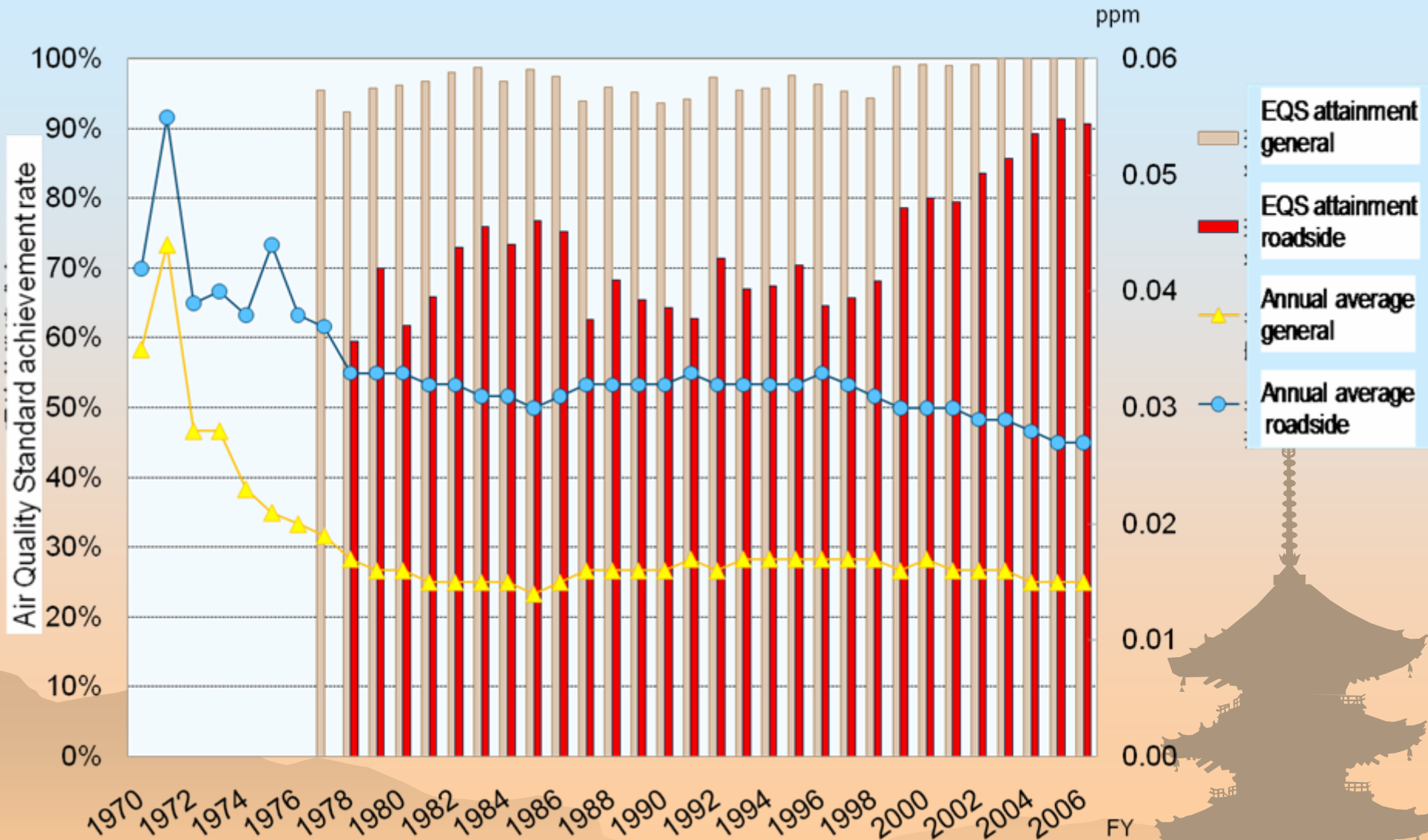
Example on Dec. 4. 2008
Available to the Public

Trends of SO₂ Concentration



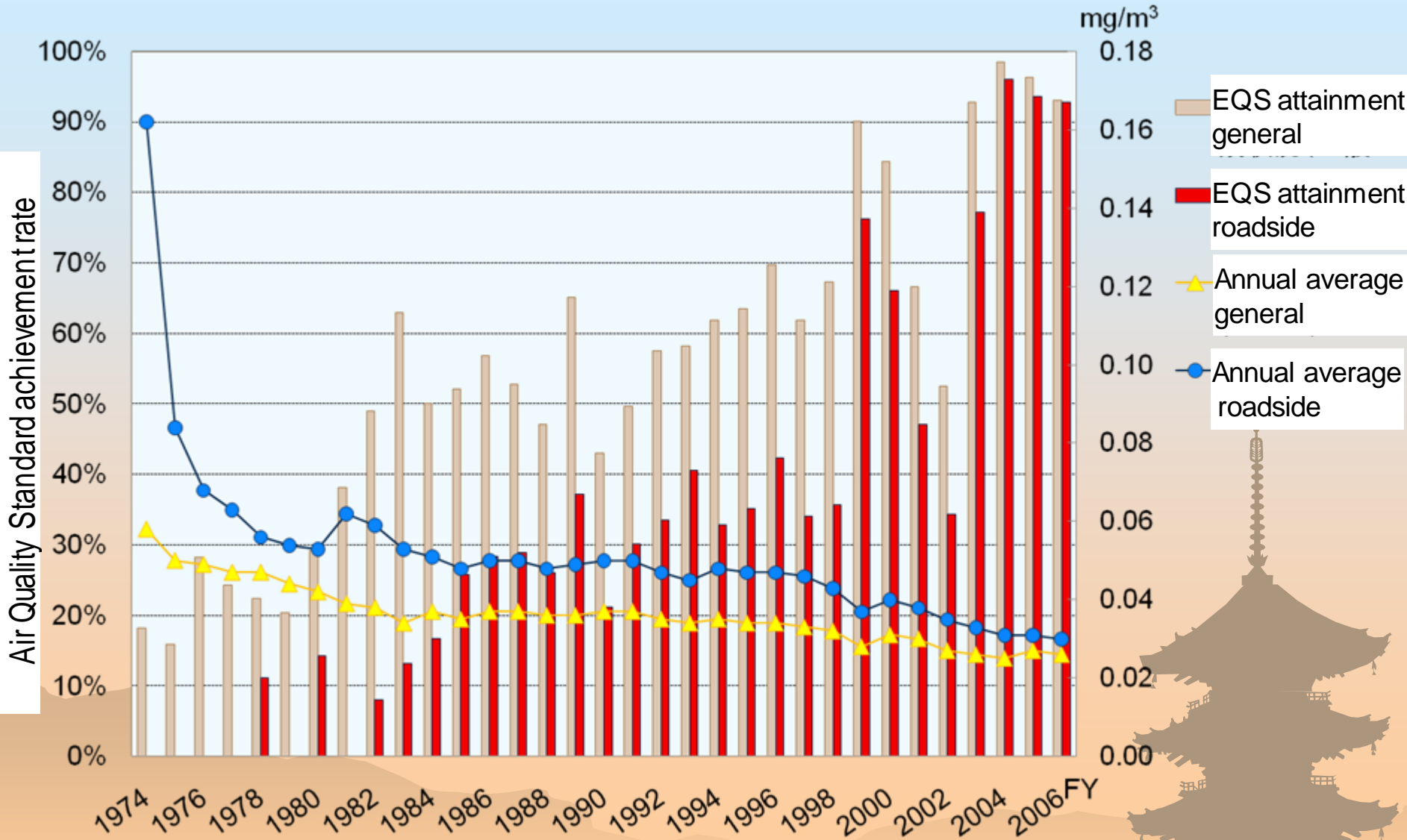
For 1965-1985, SO₂ showed a significant improvement and, in recent years, a gradual improvement.

Trends of NO₂ Concentration



In recent years, NO₂ has shown a gradual improvement .

Trends of SPM Concentration



In recent years, SPM has shown a gradual improvement in annual average concentration.

Thank you for your attention

Ministry of the Environment, Japan

<http://www.env.go.jp/en/>

