

# Experience of Yokkaichi City: Forerunner of air quality management in Japan

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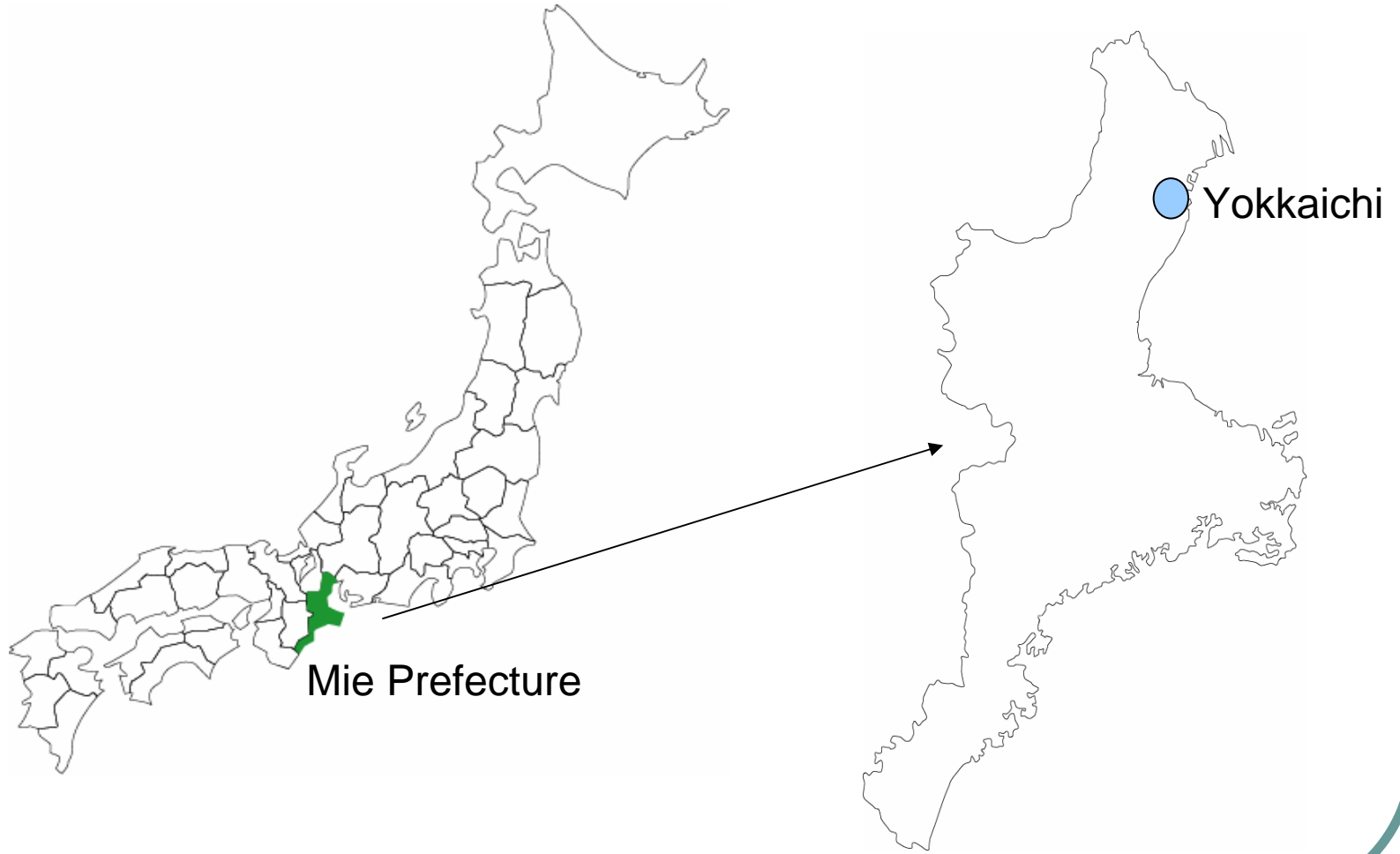
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# 1. Outline of the Yokkaichi City's Air Pollution Experience

# Yokkaichi City: Location



# History of the City

- Shiohama area:  
During WWII- Navy Fuel Store house  
1955- Cabinet decision as an Industrial site  
1959- Biggest industrial complex in Asia installed  
Energy Fuel: Oil with sulfur content from Middle east

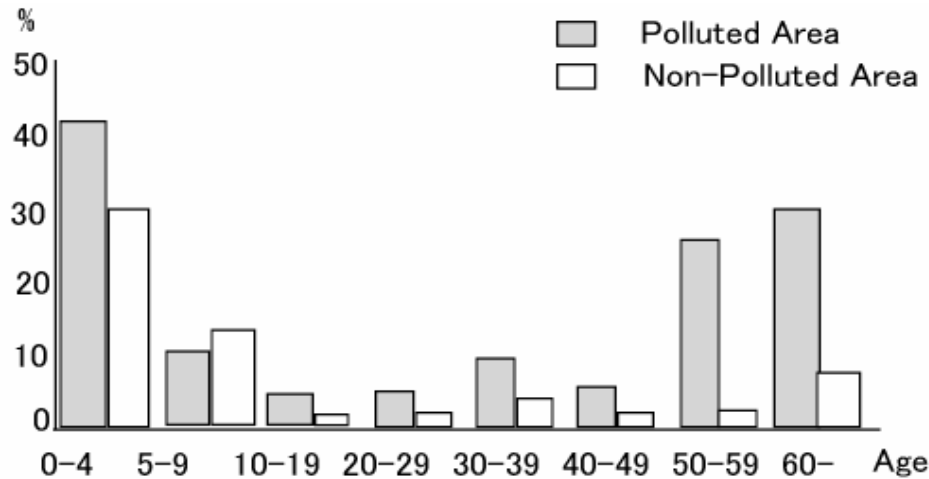


Yokkaichi City's  
petrochemical complex in  
1950s

# Citizens Health Damage in late 1950s-60s

- Unusually high incidence of bronchial asthma, especially in elder citizens

Bronchial Asthma by Age Bracket in Yokkaichi (1960)

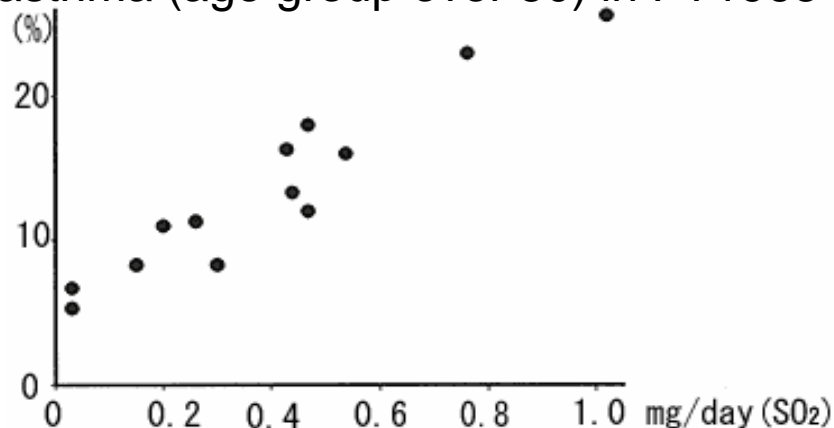


Source: Mie Prefecture

# Co-relation b/w SOx and Patients

- Professor at Mie University announced the co-relation between SOx emission and Asthma patients (1964)

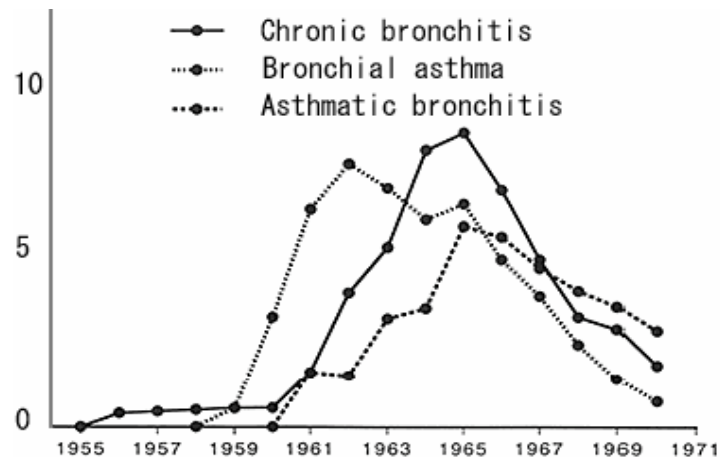
Relation b/w SO<sub>2</sub> and the annual patients of asthma (age group over 50) in FY1963



Source: Mie Prefecture

# Decrease of new patients appearing rate by higher smokestacks

- K-Value method: Higher Smokestacks countered the outbreak of the bronchitis patients (1965-1971)

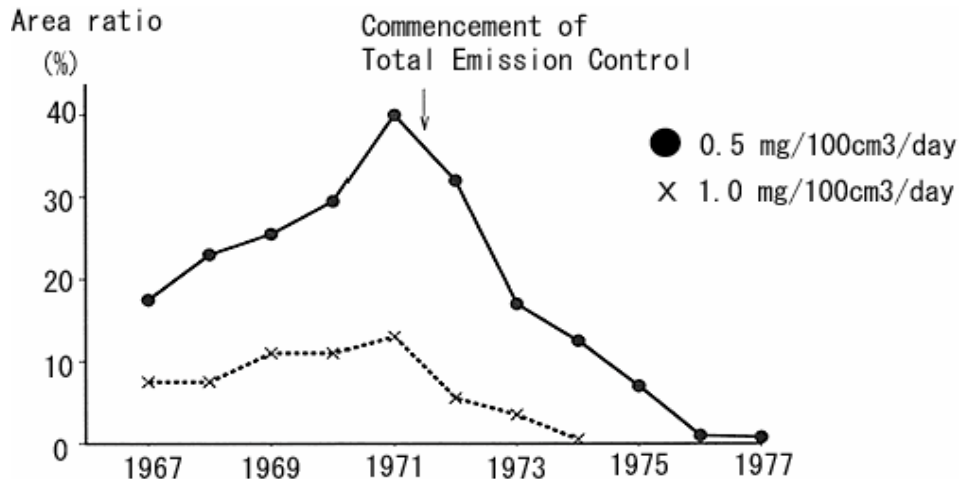


Source: Mie Prefecture



# SOx Emission of Yokkaichi

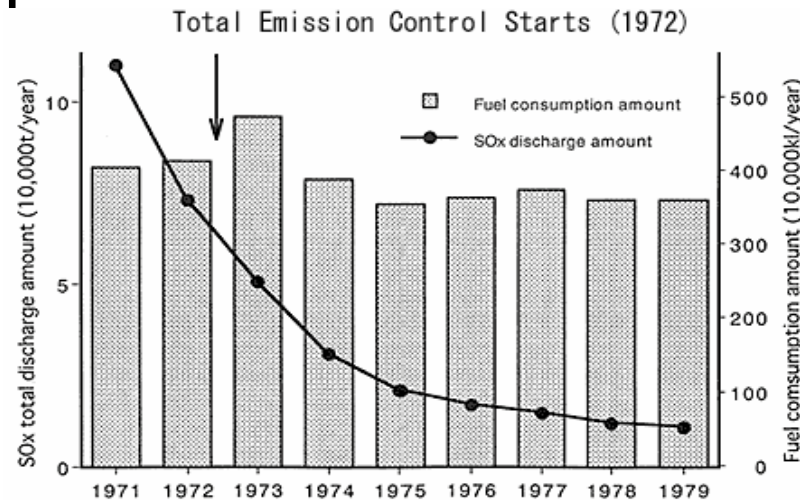
- Ratio of the SOx polluted area increased by higher smokestacks
- Total emission control in 1972 bolstered the expansion in late 1970s



Source: Mie Prefecture

# Total emission control in 1971

- Total Emission Control: Air diffusion simulation and exhaust gas desulfurizer at the factories finally solved the problem in Yokkaichi

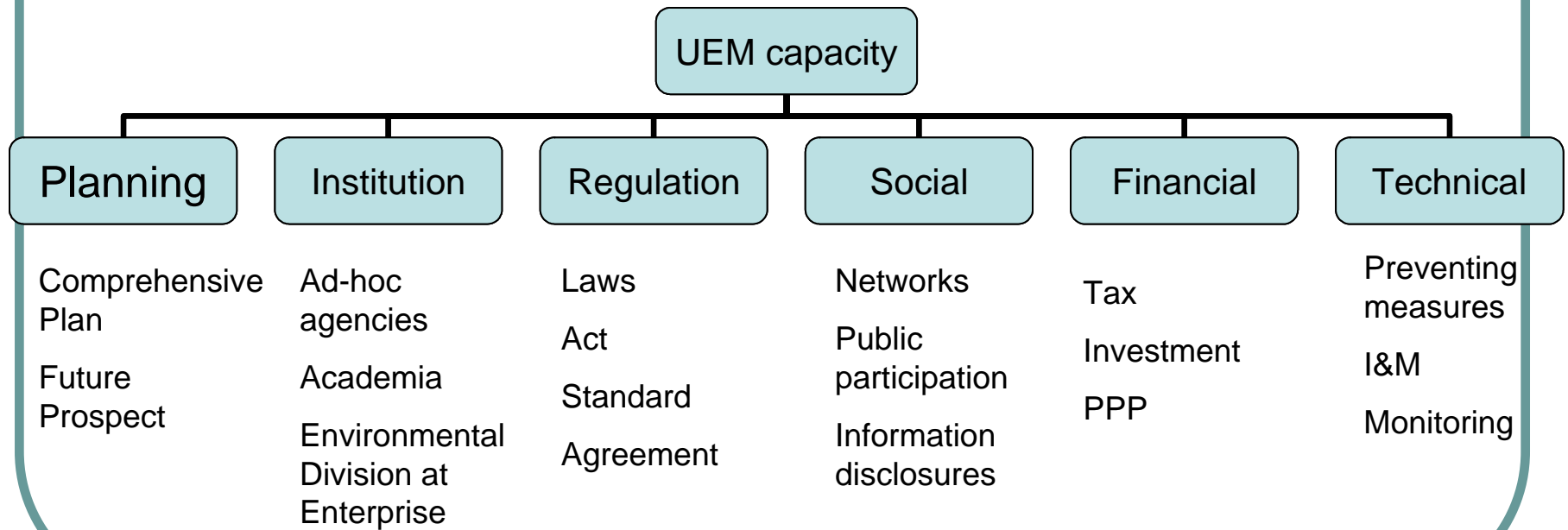


Source: Mie Prefecture

## 2. Analysis of the City's environmental management capacity

# Urban Environmental Management Capacity

## IGES's Urban Environmental Management Capacity Evaluation Components



Source: Memon & Imura 2002

# Regulatory Capacity

When city started to suffer, there was no Act on environmental pollutions in Japan

- 1962 Smoke and Soot Act → 1964 City accredited as Designated Area
- 1965 Yokkaichi ordinance: medical expenses borne by the city
- 1972 lost lawsuit of enterprises: recognized the legal responsibility of the polluters

# Comprehensive environment monitoring system 1

1959 April	Yokkaichi No.1 industrial complex began operation
1962 December	Started the measurement of SO <sub>2</sub> in Isozu of Yokkaichi City using the first automatic measurement equipment in Mie Prefecture
1966 November	Started constant monitoring using an analog telemeter method at four locations in Yokkaichi City
1972 April	Enforcement of regulation of SO <sub>x</sub> total emission by Mie prefectural environmental pollution prevention ordinance
1973 March	Renewal of atmospheric environment monitoring telemeter system, the establishment of an atmospheric source of generation monitoring system and the simultaneous instruction system
1974 October	Enforcement of regulation of NO <sub>x</sub> total emission by the revision of Mie prefectural environmental pollution prevention ordinance
1976 August	Switching the regulation of SO <sub>x</sub> total emission to a law
1977 March	Achievement of environmental criteria for SO <sub>x</sub> in Yokkaichi area
1985 April	Drawing up a plan to establish an air pollution wide area monitoring system
1992 May	Started the operation of photochemical air pollution prediction system in Hokuse area
1999 August	Started the operation of comprehensive environment monitoring system

Source: ICETT

# Comprehensive environment monitoring system 2

## A: Data collection

Measurement stations collect the concentration data of contaminant in the atmosphere, accumulate and calculate them. At regular intervals, the stations transmit the results to the Environmental Education Information Center

## B: Data analysis and monitoring

The center classifies and analyzes the measurement data transmitted from measurement stations using servers while displaying the data all the time. The center also monitors the operations of each system and if they are working normally.

## C: Information disclosure

The data analyzed at the Environmental Education Information Center are transferred to a monitoring terminal in Mie prefectural office and constantly monitored. The prefectural office can respond immediately in an emergency. The Internet also shows this information.

Source: ICETT

# Social Capacity

- Academia's interest in local problems: Mie Prefecture university's study on impact of SO<sub>2</sub> and Asthma played key role at the court
- Disclosure of information: At the court, the study result was introduced and helped to make the consensus throughout the country



# Institutional Capacity

- 1964 Kurokawa Investigation Group from Ministry of International Trade and Industry & Ministry of Health and Welfare advised drastic innovation of the Urban Environmental Management in the area (urban redevelopment, healthcare system, labor problem, and financial mechanism)
- Mie Prefecture: Environmental Bureau was founded

# Financial Capacity

- 1965 Yokkaichi ordinance medical expenses borne by the city
- 1970 Remedial act applied
- 1972 Compensating by polluters applied
- 1973 National government: Japanese Pollution-Related Health Damage Compensation Law applied

# Technical Capacity

Lessons learnt: Stopgap measure can cause some more.

- Introduction of high smokestacks of the petrochemical industries after 1965 . . . the area of pollution enlarged by overlay of diffused gas ... Polluted area peaked in 1971
- Then in 1972 the sulphur reduction at the source “Total Emission Control” started (1976 mission accomplished: 0.017 ppm in all area)

### 3. Comparison with the successor cities in Japan

# Characteristics of Yokkaichi Experience

1. Drastic measure “Total Emission Control” was taken in 1972, 12 years after the major complaints
2. Unlike Minamata or itai-itai disease the Bronchitis was a traditional disease and the epidemiological cause-and-effect was difficult to prove at that time

# SOx measures in other Japanese Cities

City	Date of major action started / Important Characteristics
Yokkaichi	<b>1972</b> / Took over 10 years for sweeping action; First Lawsuit in environmental pollution in Japan
Yokohama	<b>1964</b> / Institution: Medical association Regulation: Agreement → Ordinance Finance: Funding ability of Mega-enterprises
Osaka	<b>1969</b> / Institution: Administrative advice by Local government
Kitakyushu	<b>1972</b> / Regulation: Agreement b/w Enterprise and local government Finance: Funding ability of Mega-enterprises

## 4. Adaptability to Asian Developing Countries

# Prototype of Assessment System

- Kurokawa Investigation Group dispatched by the central government in 1964 is evaluated as a prototype of environmental assessment

Cf: Environmental Assessment Laws in Thailand (1974), Philippines (1978), China (1981), Pakistan(1983)



# Academia's cooperation and Information disclosure

- Local university was interested in the local environmental problems and results were shown to the public; this helped the local consensus

Cf: At Surabaya, Universities such as ITS/ State University of Surabaya/University of Airlangga are eager to tackle local environmental problems

# 5. Conclusion

# Conclusion

- Incunabula of Japanese Environmental Pollution Management: Struggle was one of the hardest in then economy - prioritized society
- Cooperation by academia and information disclosure / prototype of environmental assessment can be appreciated for developing countries

FIN

Thank you very much for your  
attention:

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