Environmental Pollution in Japan

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Introduction
What is environmental pollution?
Social disaster affecting an extensive area as a result of human activities, which cause damage to human health or the living environment

Seven typical pollutions
Air pollution  Water pollution  Soil contamination
Noise  Vibration  Ground subsidence  Offensive odors

History -Before 2nd World War -
1880s  Ashio copper mine
First pollution problem in Japan

1920s
Factory  Dam
Smoke, waste liquid  Landslide, muddy water

1930s
Coal industry  Urban problem
Ground subsidence  Air pollution, vibration

Summary
**1960s**

Four big pollution disease

- Niigata Minamata Disease
- Itai-itai Malady
- Yokkaichi Asthma
- Minamata Disease

**Highly awareness of environmental pollution**

**Public opinion**

- Economic growth
- Environmental conservation

- Basic Act for Environmental Pollution Control (1967)
- Environmental agency (1971)

**1970s**

- Photochemical smog
- Ozone layer

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**Minamata disease**

**What is Minamata disease?**

- Discovered around the Minamata bay in Kumamoto in 1956
- Methyl mercury is causative agent
- Released from a nitrogen Minamata factory

**Damage**

- To person
- To environment

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**Minamata disease**

**How did Minamata disease occur?**

- Catalyst
- Byproduct
- Methyl mercury
- Factory
- Drainage water
- Sludge
- A nitrogen Minamata factory

- Land
- Sea
- Big fish
- Little fish
- Food chain

- House

**Total number of deaths and fetal deaths: 1,064**
**Minamata disease**

### Countermeasure

**Setting of net as a partition**

- **Purpose**: shut up the polluted fish
- From 1974 to 1997 (23 years)
- Full length is 4400 m

**Reclamation work**

- **Purpose**: store polluted soil underground
- From 1977 to 1990 (13 years)
- Total cost is 485 billion yen
- Total area is 58.2 ha

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**Niigata Minamata Disease**

In 1965, Niigata Minamata Disease was confirmed.

- Methyl mercury was discharged from Showadenko-Kanose factory, where the acetaldehyde was being produced.
- Bioconcentration occurred in The Agano River.
- People who ate the river fish developed disease, similar to the Minamata disease.

※Methyl mercury was removed by the dredging work.

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**Anti-mercury**

After the damage occurred by mercury, the measures have been taken.

- **Central government**
  - Regulation of mercury use in the manufacturing process.
- **Industry**
  - Reduction of the use of mercury.
  - One of the case... Using of Wacker process

**What is Wacker process?**

- The old method
  - \( CH \equiv CH + H_2O \)
  - \( Hg^2+ \)
  - \( CH_2 \rightarrow CHO \rightarrow CH_3CHO \)
- Wacker process
  - \( 2CH_2 = CH_2 + O_2 \)
    - \( \downarrow PdC_2Cl \)
    - \( CH_3 = CHOH \rightarrow CH_3CHO \)

As the result... Demand of mercury in Japan (ton/year) decreased.

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**Itai-Itai Malady**

What is Itai-Itai Malady?

- Discovered around Jinzu River lower reach in 1910-1970
- Cadmium(Cd) caused
- Damage to *people and environment*

- **Toyama**
  - **Jinzu River**
  - **Kamioka Mine**
  - **Takahara River**

**How to use water of Jinzu River**

- Fishing industry
- Agricultural water
- Daily life water
- CD
- Zn Refining plant
- Kamioka Mine
- Takahara River
Itai-Itai Malady

Damage to People
- Strong pain
- Fracture very easily
- Debility and die

Damage to Environment
- 48% of rice paddies were polluted
- Barrier to growth of paddy
- Barrier to growth of fish
- Plants died down.

Countermeasure

Source of outbreaks

Prevent smoke elimination
Check drained water
Prevent leaked water

Damaged environment

Recover plants
Recover soil

Polluted soil
New soil
Non-polluted soil
Tillage soil

Itai-Itai Malady

Yokkaichi Asthma

What is “Yokkaichi Asthma”? 
- typical pollution disease by air pollution
- occurred in the city of Yokkaichi in Mie Prefecture between 1960 and 1972
- Cause was that $SO_x$ occurred by burning of petroleum and crude oil.

Yokkaichi Asthma

Cause and Symptoms

About 100,000 tons of sulfur oxides (sulfurous acid gas) had been discharged from the Yokkaichi Complex.

- chronic obstructive pulmonary disease (慢性閉塞性肺疾患)
- chronic bronchitis (慢性気管支炎)
- pulmonary emphysema (肺気腫)
- bronchial asthma (気管支ぜんそく)

Some of them even end up dead.
Yokkaichi Asthma

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- Chronic bronchitis (慢性気管支炎)
- Pulmonary emphysema (肺気腫)
- Bronchial asthma (気管支ぜんそく)

The pollution spread the pollution over a wider area.

Countermeasure

- Set up the air cleaner and gargle room
- Introduction of dry skin brushing
- Mask which contains active carbon
- Installation of desulfurization equipment
- Switching to low-sulfur crude oil

Yokkaichi Asthma

After that...

- Lead of the Air Pollution Control Law and the "Total Volume Control"
- Environment has dramatically improved, but there are still 500 patients.

Summary

- Japan experienced a number of serious environmental pollutions.
- We should not waste the experiences. We must learn from them and move on to sustainable society.
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