

1. POLLUTION OF THE AIR, WATER AND SOIL
2. GROUND SUBSIDENCE AREAS AND VOLUME OF PUMPED UP GROUND WATER. MAJOR GROUND SUBSIDENCE AREAS
3. EXPENDITURES FOR PUBLIC WORKS NATURAL DISASTER REHABILITATION PROJECTS

1. Pollution of the Air, Water and Soil

Japan has evolved highly dense economic activities in its limited national land. The problems of environmental pollution which arose in conjunction with its economic activities have become grave social questions due to the inadequacy of the measures taken for its prevention. There has recently been progress in the systematization of environmental measures, and attempts are being made to apply a wide variety of more rigid restrictive measures. As a consequence, there has been a certain degree of improvement in the ways and means to cope with environmental pollution, to be sure, but there still remain many problems yet to be overcome in relation to environmental pollution. Environmental pollution comes in atmospheric pollution, water pollution and soil pollution. Since there are various indices for pollution and water turbidity, preparations for an investigation or observation differ, depending on the index.

Sulfur dioxide is generated by the combustion of oils particularly, heavy oils. The consumption of heavy oils has been increasing from year to year, but there has been a drop in the concentration of sulfur dioxide since 1968 due to the availability of crude oils low in sulfur content and the adoption of desulfurizing technology. As of March 1973, there exist 1,071 surveillance and observation stations against the concentration of sulfur dioxide. Attempts are also being made to streamline the network of surveillance and observation against oxidants, carbon monoxide, floating dust, and floating soot.

The pollution of rivers, lakes or littoral areas in major cities is conspicuous. Particularly conspicuous is the turbidity of smaller rivers in big cities. In 1973, BOD was measured at 2,180 points for rivers and 220 points for lakes and seas, and COD was measured at 1,020 points.

The pollution of farmlands with heavy metals, although localized, is observed at a number of places. A law governing the prevention of farmland soils from pollution was enacted in 1970. Under one of the government ordinances, cadmium and its compounds as well as copper and its compounds were designated as specified toxic substances, and the Government or prefectural governments have been striving to prevent and eliminate farmland pollution. Arsenic was also designated as a specified toxic substance in 1975.

**Salient Points of the Legend and Map Compilation**

For this map, the concentration of sulfur dioxide, against which there are many observation points throughout Japan, was looked upon as the index for atmospheric pollution. Taken up as the index for the pollution of water were BOD for rivers and COD for lakes.

pphm : Parts per hundred million.

ppm : Parts per million.

BOD : The quantity of oxygen necessary for aerobic bacteria to oxidize and dissolve organic matter in the water.

COD : The quantity of oxygen necessary to oxidize organic matter in the water by oxidizing agent. The heavier the pollution of water, the greater the quantity of COD.

**Sources**

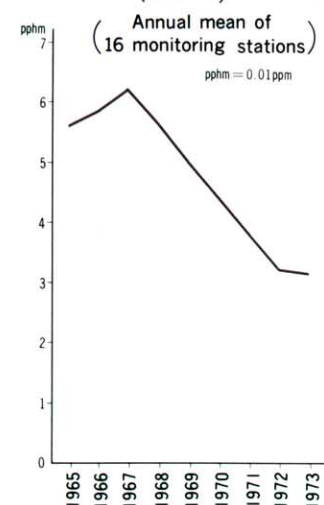
1. Environment Agency, Pollution of the Air in Japan, 1974.
2. Environment Agency, 1975 Yearbook on Water Quality in Water Areas in the Entire Nation for Public Use.
3. Environment Agency, 1975 Quality of Environment in Japan.

2. Ground Subsidence Areas and Volume of Pumped Up Ground Water. Major Ground Subsidence Areas

As of February 1975, land subsidences were recorded in 40 areas of 31 prefectures, amounting to a total area of 6,680 km<sup>2</sup>. Of this total area, land subsidences in areas lower than sea level, or in what are commonly known as "zero-meter areas," measured 1,168 km<sup>2</sup>.

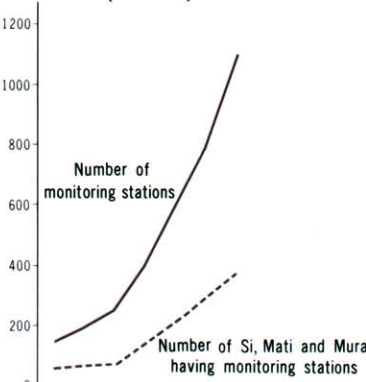
It is believed that land subsidences began in Tōkyō, Ōsaka and other cities in the Meiji Era (about 1900) but started increasing in dimension at a rapid pace in the Syōwa Era (about 1930), producing great damage, such as by high tide, with the consequence that attention was focused on land subsidences as a grave social problem. Since the operation of factories was curtailed due to raids during World War II, there emerged a drop in the underground water pumping quantity, thus suspending the subsidence of lands for some time.

CHANGES IN SULFUR DIOXIDE CONTENT IN ATMOSPHERE (1975)



(Compiled from Quality of Environment in Japan)

CHANGES IN THE NUMBER OF SULFUR DIOXIDE MONITORING STATIONS (1975)



(Compiled from Pollution of the Air in Japan)

Starting in or around 1955, land subsidences began to increase in terms of quantity and area, and their repercussions were felt in local cities and rural areas.

One of the principal reasons for the subsidence of land is that the ground is contracted and consolidated due to an excessive pumping of underground water. For this reason, the subsidence of land tends to take place in an alluvial plain where the weak strata, including the sand and gravel stratum, which features an abundance of underground water. In recent times, the strata of the Pleistocene and preceding epochs have come to be contracted due to the pumping of underground water from deeper underground strata.

Underground water is pumped up in most instances for use as industrial water, tap water and water for miscellaneous utilization in buildings (such as for air-conditioning). Other cases are the pumping of water associated with the collection of natural gas in the periphery of Niigata and the sand beach of Kuzyūki in Tiba Prefecture and also the pumping of water for use in farmlands near Siroisi Mati in Saga Prefecture.

In the area where the subsidence of a land has taken place, buildings were damaged and drainage functionally lowered. Besides, the area tends to be inundated by high tides or floods. To prevent the subsidence of land, tide embankments are constructed and the levees raised with additional earth laid on the ground. In addition, a wide variety of restrictions are imposed on the pumping of underground water to suspend the subsidence of land.

**Salient Points of the Legend and Map Compilation**

With respect to the quantities of underground water pumped up, the quantities that have been pumped up for waterworks and industry in the last five years were tabulated for this map on the basis of statistics on industry and waterworks. In classifying areas for the tabulation, reference was made to the classification of industrial areas in the Census of Manufactures. For this reason, this map does not necessarily show the actual quantity of pumped underground water which is responsible for the subsidence of land. The data provided in this map, however, may hopefully serve as a general yardstick to clarify the interrelationship.

The distribution of land-subsided areas is based on the "Quality of Environment in Japan".

The subsidence contours were drawn on the basis of the leveling that has been conducted by the Geographical Survey Institute and prefectural governments.

**Sources**

1. Ministry of Health and Welfare, Statistics on Waterworks 1968-1972.

STATUS OF LAND SUBSIDENCE AREAS THROUGHOUT THE NATION (1975)

Prefecture	Names of areas	Area of land subsidence (K.m <sup>2</sup> )	Area of 0-meter zones (K.m <sup>2</sup> )	Maximum land subsidence at bench marks (mm)		Annual maximum land subsidence (mm)
				(mm)	Observation period	
Hokkaidō	Kusiro Heiya	85		140	1952-1969	8
	Tokati Heiya	300		120	1953-1969	7
	Tomakomai	30		100	1955-1968	8
Aomori	Isikari Heiya	150		90	1954-1968	7
	Aomori Heiya	40	3	390	1958-1974	82
	Hirosaki	65		90	1938-1968	3
Miyagi	Sendai Heiya	30		>300	-1974	>100
	Akita	10		850	1956-1973	58
Yamagata	Yamagata Bonti	65		about 300	1967-1971	about 60
	Hukusima Bonti	15		110	1954-1967	8
Hukusima	Iwaki	40		260	1953-1967	19
	Haramati Southern part of national capital region	25		1,000-2,000	-1974	about 250
Saitama	Tiba	1,000		1,530	1961-1973	252
	Tōkyō	600	15	1,650	1964-1973	176
Kanagawa	Tōkyō	700	125	4,540	1919-1973	217
	Kanagawa	120	9	1,510	1931-1972	112
Niigata	Tiba	250		920	1931-1973	109
	Kanagawa	100		350	1968-1973	65
Niigata	Etigo Heiya	430	205	2,590	1955-1973	61
	Nagaoka	50		100	1966-1973	10
Toyama	Takada Heiya	170		200	1968-1973	31
	Toyama and Tonami Heiya	25		90	1955-1972	12
Isikawa	Nanao	15		250	1970-1974	37
	Kanazawa Heiya	20		70	1949-1971	9
Hukui	Hukui Heiya	75		180	1966-1971	36
	Yamanasi	60		240	1950-1972	16
Sizuoka	Gakunan	10		80	1950-1972	6
	Sizuoka, Simizu	10		100	1950-1972	5
Gifu	Nōbi Heiya	75	60	40	1972-1973	38
	Aiti	690	328	1,050	1963-1973	235
Mie	Aiti	130	90	1,330	1961-1973	213
	Kyōto	?		?	?	?
Kyōto	Kyōto Bonti	120		460	1927-1971	27
	Ōsaka	Hansin	470	86	2,770	1937-1971
Hyōgo	?	100	18	2,840	1932-1973	38
	Toyooka Bonti	10		160	1951-1965	9
Tottori	Himezi	?		?	?	?
	Tottori Heiya	10		150	1965-1970	31
Okayama	Okayama Heiya	30		120	1964-1971	19
	Hirosima	Hirosima Heiya	85	9	200	1965-1971
Tokushima	Tokusima Heiya	20		110	1965-1971	18
	Kagawa	Takamatu	15		80	1947-1964
Ehime	Iyomisima	10		50	1964-1970	9
	Kōti	Kōti Heiya	25	13	150	1955-1970
Saga	Tukusi Heiya	400	207	780	1957-1974	91
	Kumamoto	Kumamoto Heiya	?		40	1962-1969

(Compiled from Quality of Environment in Japan)

2. Ministry of International Trade and Industry, Census of Manufactures, Report on Industrial Land and Water, 1968-1972.
3. Environment Agency, 1975 Quality of Environment in Japan.
4. Data from the Geographical Survey Institute and prefectural governments.

3. Expenditures for Public Works Natural Disaster Rehabilitation Projects

In conjunction with extraordinary natural phenomena, such as winds and waves in winter, high tides, earthquakes and landslides, the Government, prefectural governments and other local administrative authorities are obligated under the Basic Law for Disaster Relief to carry out rehabilitation measures. The necessary expenditures are stipulated by the Law Governing the Sharing by the National Treasury of the Expenses for the Rehabilitation of Disaster-Afflicted Public Works and others.

Public works, as referred to here, include rivers, seacoasts, anti-erosion works, roads, ports and harbors, fishing ports, etc., and their associated facilities. They are placed under the jurisdiction of the Ministry of Agriculture and Forestry, Ministry of Transport and Ministry of Construction.

The dimension and frequency of the disasters brought about by extraordinary natural phenomena differ, depending on the year, so much so that the funds laid out for the rehabilitation of disaster-afflicted public works vary, depending on the year. The outlays, however, were registered at ¥399,000 million in 1972, of which ¥380,200 million was set aside for the Ministry of Construction, ¥12,600 million for the Ministry of Agriculture and Forestry and ¥6,200 million for the Ministry of Transport.

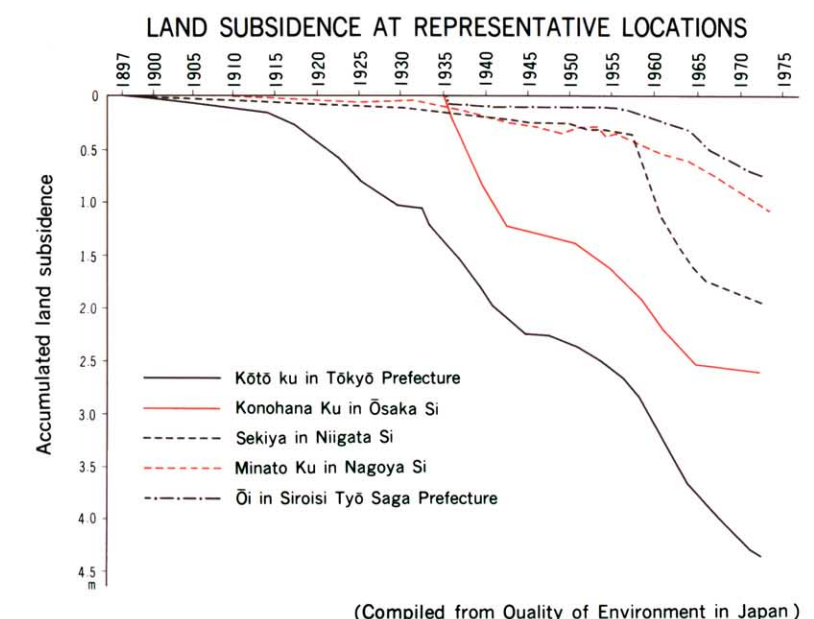
Classified by cause, the outlays for disaster rehabilitation from 1963 through 1972 were large for each prefecture facing the Japan Sea, where seasonal winds and waves are prominent in winter; for each prefecture extending from Hokkaidō to Hukui Prefecture along the coast of the Japan Sea for melting snow; for each prefecture along the coast of the Pacific Ocean south to Kantō Region for torrential rains and typhoons; and for Niigata and Aomori prefectures for earthquakes due to the influences brought about by the Niigata Earthquake (1964) and offshore Tokati Earthquake (1968).

**Salient Points of the Legend and Map Compilation**

The damages inflicted by extraordinary natural phenomena would presumably result in the outlay of exceedingly enormous amounts of money, but it would be difficult to grasp the aggregate expenditure because no statistics are prepared on the amount of damage, including those inflicted on private properties. The funds laid out for the rehabilitation of disaster afflicted public works do not represent the aggregate amount of the damages inflicted in any way but may be looked upon as a yardstick to indicate the regional variation of a given disaster.

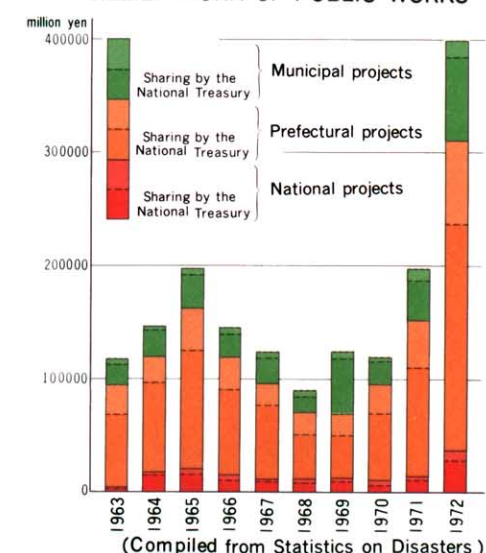
**Source**

1. Ministry of Construction, Statistics on Disasters, 1964-1973.



(Compiled from Quality of Environment in Japan)

CHANGES IN OUTLAYS FOR DISASTER RELIEF WORK OF PUBLIC WORKS



(Compiled from Statistics on Disasters)

