

**CHAPTER 9 FINAL REMARK**



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The goal of this study was, as described in the Scope of Work, to present concrete air pollution control measures for the medium-term (about 10 years) considering the present social and economic conditions in Turkey and Ankara City.

To achieve the goal, the JICA Team conducted the Study, in cooperation with the General Directorate of Environment of Turkey. The Study started in November 1984 and lasted 15 months covering many technical fields including the on-site investigation during the winter of 1984/85.

In that winter, Ankara was hit by the severest cold wave in the past 30 years. It is inferred that the consumption of heating fuels and consequently, the degree of air pollution were higher in comparison with normal winters.

Basically, the final solution to the problem of air pollution is the changeover of energy sources; from fossil fuels to other clean energy sources. When air is seriously polluted by sulfur dioxide resulted from combustion of fuels for domestic heating, as is the case in Ankara, a desirable course for the solution is to switch the use of energy sources from the high sulfur content fuels to less sulfur content, and further to energy sources of no sulfur contained, such as natural gas or electricity.

In the case of Japan, for some 15 years since the late 1960s, many industrial areas suffered from air pollution with high concentration of sulfur dioxide. Since the early 1970s to the present, the situations in these areas have been substantially improved with the tremendous efforts made by governments, industries, and the public, in the direction of the changeover from high sulfur content fuels to low sulfur content fuels.

In the initial stage of this Study, however, it became evident that the present social and economic conditions in Turkey would not permit such a radical measure like energy-changeover for the project of target period for 10 years. The energy changeover should be established as the government policy in a long-term national plan.

Keeping the above limitation in mind, the following basic strategy was adopted for drawing up the plans for pollutant source control.

- 1) Occurrence of the warning level of SO<sub>2</sub> concentration prescribed in Ankara City (700 µg/m<sup>3</sup> or about 270 ppb for the 1st level) should be prevented.
- 2) Control measures to be proposed should not require extensive alteration of facilities and heating methods presently in use.
- 3) Energy saving should be promoted.
- 4) Utilization of Turkish lignite that is extensively used at present for heating should be given a high priority.

The mid-term source control measures thus proposed as the results of the Study can be broadly classified into the following two categories.

- 1) Improvement of combustion apparatus and facilities, combustion methods, maintenance, etc. to save heating fuels, thereby reducing the emission of pollutants.
- 2) Improvement of quality of Turkish lignite (as biocoal and rentan) to achieve the reduction of pollutant emission.

Both of the above measures should be carried out simultaneously. Supply of biocoal and rentan alone will not bring about the full effect in the reduction of pollutant emission without the help of the effective management of fuel combustion. In regard of biocoal, further studies are necessary on the specifics of the product, since it is rather a new technology.

In addition to the measures presented above, it is strongly recommended that various measures already adopted by the Government of Turkey, such as thermal insulation on buildings, prohibition of the use of lignite in heating boilers in new buildings, training boiler operators, should be further enforced. With execution of all these measures together, it is expected that the air quality of Ankara will be considerably improved.

This Study was aimed, to the best, at the mid-term future within 10 years. It is hoped that the switchover to clean energy sources will be steadily carried out under a comprehensive long-term plan to achieve the level of air quality, such as set forth in the guideline of the World Health Organization.

ANNEX

Table for Conversion of Unit of SO<sub>2</sub> Concentration

From ppb to $\mu\text{g}/\text{m}^3$				From $\mu\text{g}/\text{m}^3$ to ppb			
ppb	$\mu\text{g}/\text{m}^3$	ppb	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	$\mu\text{g}/\text{m}^3$	ppb
1	2.572	600	1543	1	0.3888	1100	428
10	26	700	1800	10	3.9	1200	467
20	51	800	2058	20	7.8	1300	505
30	77	900	2315	30	12	1400	544
40	103	1000	2572	40	16	1500	583
50	129	1100	2829	50	19	1600	622
60	154	1200	3086	60	23	1700	661
70	180	1300	3344	70	27	1800	700
80	206	1400	3601	80	31	1900	739
90	231	1500	3858	90	35	2000	778
100	257	1600	4115	100	39	2500	972
150	386	1700	4372	200	78	3000	1166
200	514	1800	4630	300	117	3500	1361
250	643	1900	4887	400	156	4000	1555
300	772	2000	5144	500	194	4500	1750
350	900	2100	5401	600	233	5000	1944
400	1029	2200	5658	700	272	5500	2138
450	1157	2300	5916	800	311	6000	2333
500	1286	2400	6173	900	350	6500	2527
550	1415	2500	6430	1000	389	7000	2722

Note: Considering the general meteorological condition of Ankara in winter, the condition of 0°C and 0.9 atmospheric pressure was used for the unit conversion.





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