Kitakyushu Initiative for a Clean Environment: Successful and Transferable Practices

Lanzhou (China): Special Program on Air Pollution Control

Policy Research Centre for Environment and Economy[1]

Target Area: Air pollution

Time Period: 1998-

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[1] State Environmental Protection Administration (SEPA), People's Republic of China

1. Background: origin of the Special Program

The city of Lanzhou, a capital of Gansu Province, is located on the joint between Loess Plateau, Qinghai-Tibetan Plateau, and the Inner Mongolian Plateau. The urban area lies in the river valley of the Yellow River with two mountains standing on the north and south, and the Yellow River running through. The urban area is 35 km long from east to west and 5 km wide from north to south, which makes it a typical band-shaped city.

The city of Lanzhou is the largest industrial city on the upper reaches of the Yellow River as well as a major industrial base in northwest China. An industrial system with pillar industries, such as petrochemical industry, non-ferrous metal metallurgy, light industry and catering services, and machine-building and electronics industries, was initially established in Lanzhou. According to statistics on 36 sectors in the city in 2000, the gross industrial output value was composed of 41.8% from petrochemical industry, 6.5% from the sector of construction materials and non-metallic minerals products, and 12.1% from the non-ferrous metal metallurgy.

The GDP of Lanzhou in 2000 was 30.94 billion yuan, which increased by 8.8% than 1999. The population of the city is 2,906,800 and the per capita GDP is 10644 yuan (Approximately USD 1293, USD1 = RMB8.23).

Unique natural geographic condition and economic characteristics determine Lanzhou's serious air pollution in winter.

The air pollution in Lanzhou is a combination of coal smoke, automobile exhaust gas, natural dust and secondary dust. Because Lanzhou is located in the Yellow River valley, it is not easy for the pollutants to diffuse, so that the air pollution is particularly extraordinary in winter. TSP and absorbable particulate seriously exceed the national standard. The air quality often hovers around the warning limit, and the health of local residents is seriously affected.

Reasons causing this particular pollution situation lie in six aspects. (1) Lanzhou lies on the Loess Plateau with the arid mainland climate of North Temperate Zone. The natural ecological system is fragile and the background value of TSP is high. (2) The energy structure heavily bases on coal, which approximately takes up 80% of the energy consumption. Tremendous dust and fumes are produced during the process of domestic and industrial coal consumption. (3) Heavy chemical industry structure bases on petroleum, chemical industry, electric power, and metal metallurgy, with irrational locations. Some enterprises are even located on the upper drift. On the other hand, many enterprises are faced with great difficulties in pollution abatement, long period of treatment, and high cost because they were established a long time ago with low starting point in terms of technology. (4) The number of automobiles is increasing rapidly from 50,000 in 1990 to 128,000 at present. This mobile pollution source poses great pressure on the urban atmospheric environment. (5) The pressure from population is increasing unceasingly. The population of Lanzhou increased from 2.52

million in 1990 to 2.9068 million at present. (6) Located in western China, Lanzhou is less developed in terms of economy and technology. The approaches to controlling air pollution are behind economic development. The investment capacity in pollution treatment is rather limited.

Conventional pollution control strategies cannot work under the specific pollution causes and serious pollution situation in winter, which makes the Special Program an inevitable choice.

Ever since the 1970s, Lanzhou has been making great efforts in controlling air pollution. Besides implementing national environmental policies and plans, Lanzhou took a number of creative and locally featured measures and policies. For instance, during the Eighth Five-Year Plan period, the Blue Sky Plan consisted of five major projects of Afforestation, Gasification, Thermification, Sunshine, and Shape-coal in order to achieve fundamental improvement in air quality.

However, the long-term goals of the Plan made it difficult to achieve obvious improvement in air quality in recent period. Therefore a Special Program aiming at curbing pollution on a maximal basis and alleviating impacts of pollution to the health of citizen began to be implemented in 1998 in Lanzhou.

2. Achievements of the Special Program

The Special Program has achieved obvious effects since its implementation. During the heating period from November 1, 1999 to March 31, 2000, the number of days with air quality being Grade Five[2] decreased from 22 weeks in the last heating period to 11 weeks. The number of days with air quality of or better than grade three is 301. The findings of monitoring indicated that the air quality of Lanzhou is witnessing obvious improvement (See Table 2-1).

Table 2-1 Achievements of the Lanzhou Special Program

	1997	**1998**	**1999**
SO_2 (mg/m^3)	0.071	0.062	0.059
NO_x	0.065	0.065	0.053
Dust Fall (T/km2 month)	24.66	22.87	22.93
Integral Index for Air Pollution[3]	5.93	5.48	4.99

[2] The National Standards of Air Quality in China group air quality into five grades. Grade Five refers to a heavy polluted which does evidently damages to human health.

[3] *The Integral Index for Air Pollution = TSP concentration / national grade II of TSP+SO_2 concentration / national grade II of SO2+NO_X concentration / national grade II of NOx. The higher the index, the lower the air quality.*

3. Implementation areas of the Special Program

The Special Program consists of three areas.

3.1 Air pollution control in industry and catering services

(1) In addressing industrial pollution, measures were taken in two aspects under the Special Program.

- The production in enterprises or workshops with serious pollution were stopped or limited during the winter period with heavy pollution. Since 1998, the Provincial Environmental Protection Bureau, the Provincial Committee of Economy and Trade, and the government at the municipal or district levels have made decisions on limiting or stopping the production of over 100 enterprises and workshops. This was done in order to temporarily mitigate heavy air pollution in urgent cases. On the other hand, it pushed the polluted enterprises and workshops to actively respond to their pollution problems.
- The effects of the control measures by key enterprises with serious pollution were enhanced with innovation of environmental technology (See Table2-2).

Table 2- 1 Effects of Environmental Technology Innovation in Key Polluting Enterprises

Enterprises	Effects of Treatment
Lanzhou No. 2 Thermal Power Plant	Pilot activities were concluded in simple desulphurization over flue gas, which was reviewed and accepted by the environmental department in May 10, 2000. The average desulphurization rate reaches 50.7%.
Xigu Thermal Power Plant	The environmental reconstruction passed provincial examination and was accepted in October 9, 2001. The emission of dust and fume, SO_2, NOx respectively decreased by 88.82%, 21.35%, and 38.89%.
Lanzhou Aluminum Industry Corporation Ltd.	In October 25, 2001, 76 sets of large-scale prebaked anode cell were launched and test run started.
Chemical Fertilizer Plant of Lanzhou Petrochemical Corporation	The project of shifting oil fuel to natural gas was accomplished, which decreased annual SO_2 emission from 65 tons to 2 tons, i.e. by 97%

(2) In addressing air pollution caused by coal combustion by the catering services,

Management of market and catering services against pollution was strengthened under the Special Program. In addition, some special measures were taken. For instance, under the Special Program the experience of "centralized lighting for decentralized utilization" was promoted in tackling the dust and fumes aroused during the lighting process in the coal furnace used for a great number of food stalls. The basic approach is to light honeycomb-shaped briquettes with multi-holed LPG furnace. The lit briquettes will then be distributed into furnaces of various self-employed stall

keepers. The approach could avoid smoke produced by lighting the briquettes with small coal furnaces. In 96 markets in Lanzhou, 105 centralized lighting furnaces were installed providing lighting services for "decentralized utilization" to 11,000 food stall keepers, which achieved fairly good effects. On the other hand transferring coal consumption in restaurants to use electricity and natural gas has been undertaken under the Special Program. By 20 December 2002, 2113 furnaces had accomplished the transferring activity.

3.2 Control of air pollution caused by domestic and other activities

(1) The coal market was re-organized. The distribution and consumption of bituminous coal is strictly forbidden. Since the implementation of the Special Program, the focused re-organization of the coal market has been carried out continuously for three years and c City Office for Re-organizing Coal Market was established. Emphasis was put on regulation and management in coal exchange. Inspection was undertaken in the commercial network of coal in the city. The Office issues Qualification of Coal Distribution for those entities, which can pass the inspection. Efforts have been made to block faulty coal from source to avoid them in the city. In 2000, a Joint Enforcement and Inspection Panel as established by 13 governmental departments took action to liquidate 40 illegal distributors around the Dashabang region. By November 2001, the enforcement team organized under the City Office for Re-organizing Coal Distribution found illegal activities in six illegal dealers and administered punishment accordingly. Inspection was undertaken on 20,000 tons of coal, resulting in 447 tons of coal confiscated. The team effectively cracked down various illegal activities.

(2) The examination and approval of construction project of water boilers or boilers of heating with capacity less than 10 tons has ceased since June 1998. The emerging of new pollution sources has been strictly controlled and the area with central heating system has been enlarged.

(3) In order to substantially control secondary dust nuisance, the City Construction Committee transferred 50 staff to undertake inspection over 170 building sites in the four districts. Some building sites with non-compliance under the Regulations on Control of Environmental Pollution in Building Sites in Lanzhou were requested to rectify and improve their performance within certain time limits. According to the result of inspection, enclosures were set-up around most building sites. The surplus earth dug out during construction was cleared and transported on a timely basis. During the demolition of the houses, sprinkling was done. Vehicles transporting earth were all equipped with paulin to ensure non-dust spilling. Sprinkling was done when appropriate to avoid dust emission on construction sites. Cement tanks for bulk-load cement were equipped with those building site consuming bulk-load cement. Centralized cement mixing was undertaken for construction in crowded regions, which avoided secondary dust nuisance caused by transportation of sand, stone and cement. Measures were taken to control

pollution by coal combustion on building sites. The boarding houses of building sites were required to use heating systems and furnaces with LPG or anthracite coal as fuel. No soft coal, wood or construction waste should be used as fuel. Enclosures, afforestation and stiffen should be done on those building sites where construction had not yet started after clearance of the land-use approval.

3.3 Control of vehicle exhaust gas

(1) The distribution and consumption of lead-gas has been stopped. In promoting consumption of lead-free gas, the City Economy and Trade Committee, Environmental Protection Bureau, and Petroleum Corporation took joint actions. They concentrate on inspection on gas stations in the city. Full-scale distribution of lead-free gas and halting the distribution of lead-gas was achieved in October 1998 in 84 gas stations, which is 10 months ahead of national regulations.

(2) Strict examination and approval of vehicles is carried out. Registration for diesel vehicles was discontinued on July 1, 1998.

(3) Public transportation has been actively promoted. Based on self-funding of 20 million yuan, the City Bus Company purchased 135 gasoline buses in 1998 to replace some diesel buses with black smoke emission. The company also retrofitted 201 diesel buses to buses using gasoline engines. At the same time, the operation of 113 diesel buses with serious problems of black smoke emission discontinued for transportation in winter. These basically solved the bus black-smoke emission problem as intensively reported by the public.

(4) Total amount control has been imposed on taxi sector. The number of mini-type vehicle (including motorcycles) is also strictly limited. The annual examination and exhaust gas monitoring of vehicles are strictly carried out. Decommissioning and retrofitting are required of diesel vehicles within a certain time limit. Bi-fuel cars are encouraged. Urban roads have been accelerated, and the number of vehicles passing by the city reduced. Exhaust gas pollution is alleviated. The taxis launched for urban operation by 5 June 1999 must be of those national recognized cars with bi-fuel of both gasoline and LPG, whose exhaust gas reaches to national emission standards. As a result, 6 gas stations with LPG supply have been established and 450 cars retrofitted to bi-fuel cars.

4. Safeguards of the implementation of the Special Program

4.1 Legislative arrangement

The Special Program implemented in Lanzhou has a basis of local legislation. Initiated by the municipal government, local legislation entitled *Implementing a Special Program on Controlling Winter Air Pollution in Urban Area of Lanzhou* was passed by the People's Congress of the City in 1988. In order to delegate the mandate and punitive authority by various governmental agencies, the

People's Congress of the City formulated *Penalizing Measures under the Special Program on Controlling Winter Air Pollution in Urban Area of Lanzhou*. Subsequently, in order to further the substantial implementation of the Special Program, the municipal government or the People's Congress respectively promulgated a series of regulatory documents, such as *Municipal Government's Announcement on Integrated Control and Management over Air Pollution, Announcement on Preventing Pollution from Vehicle Exhaust Gas, the Tentative Administrative Method for Pollution Prevention on Building Sites in Lanzhou, and the Lanzhou Method for Concrete Premixing.*

In addition, in order to raise public awareness and gain support from the public, the municipal government effectively gave publicity to the content and significance of the Special Project with assistance from the mass media.

4.2 Institutional arrangement

In order to ensure smooth implementation of the Special Program, the municipal government and the municipal Committee of Chinese Communist Party (CPC) broke the tasks down to 12 departments or agencies: the municipal Construction Committee, Development and Planning Committee, Economy and Trade Committee, Bureau of Landscape, Bureau of Technology Inspection, Bureau of Public Security, Bureau of Commerce and Industry, Programme Bureau, Bureau of Transportation and Communication, Environmental Protection Bureau, Supervision Bureau, and the Group Company of Fuel Gas and Chemical Industry.

The provincial government of Gansu established an ad hoc Steering Panel for Air Pollution Prevention and Treatment for Lanzhou, with a provincial leader as panel chief. The panel members consist of leaders from departments of planning, economy and trade, environmental protection, construction, transportation and communication, railway, public security, finance, commerce and industry, meteorology, media, and military. Regular meetings are held to carry out timely studies and resolve emerging situations and problems in air pollution prevention and treatment.

A Steering Group for Integrated Treatment of Air Pollution was established under the municipal government of Lanzhou, with subsidiary bodies of a Working Group of Coal Combustion Pollution, a Working Group of Secondary Dust Nuisance Treatment, a Working Group of Treatment of Pollution from Coal, Oil and Smoke Caused by Catering Services, a Working Group of Industrial Pollution Treatment, and a Working Group of Vehicle Exhaust Gas Treatment. The five Working Groups separately developed treatment plans. Associated steering groups were also set up in various districts and were in charge of detailed implementation of the Special Program in the districts under their jurisdiction.

The establishment of Steering Panel or Groups at levels from province to district serves as a sound safeguard to the implementation of the Special Program. For instance, in order to ensure the implementation of shifting furnace fuel from coal to natural gas or electricity, the environmental

protection agencies of the four districts filed all the furnaces and identified tasks in phases to undertake the furnace shift. 802 scrolls or banners were hung along the streets and extensive media campaigns were launched. Enforcement officials from the city and districts carried out door-to-door inspection on individual furnaces. Another example: in order to strengthen vehicle exhaust gas management, a Lanzhou Vehicle Pollution Control Office was established on August 23, 2001. The municipal Environmental Protection Bureau and the Bureau of Public Security set up caution marks on the five major entrances to the urban area to draw drivers' attention, which read that "*The Vehicle with Exhaust Gas Exceeding the Standard (with Black Smoke Emission) is Forbidden in Urban Areas*". Since November 1, 2001, seven groups have been established by the traffic control department and the Lanzhou Vehicle Pollution Control Office to undertake vehicle exhaust gas examinations. By the end of the November 2001, 5064 vehicles had been examined, 1073 vehicles with exhaust gas exceeding the standard were checked and detained, as well as 534 tractors or vehicles for agricultural use. 1645 driving licenses were also revoked.

4.3 Financial safeguard

Lanzhou is a less developed region, compared to the cities of East China. Financial resources are limited. However, since the implementation of the Special Program, the total fund for air pollution control from the levels of province, city, and districts added up to 13.86 million yuan, among which 7 million yuan was provided from municipal finance for the purpose of the Special Program (3 million yuan in 2002). All these inputs have played an essential role for the control of atmospheric pollutants in Lanzhou.

In addition to direct inputs, the municipal government actively applied incentive policies. For example, preferential electricity price is offered to implement the boiler transformation project from coal combustion to natural gas or electricity.

4.4 Roles of mass media and public participation

At the beginning phase of the Special Program, a broad and focused media campaign helped people in Lanzhou recognize that the Special Program would benefit the public. The public provided with active supports.

In order to facilitate public participation in the Special Program, the city opened an environmental reporting telephone line (#12369) to oversee illegal activities against environmental legislation.

In the process of the implementation of the Special Program, special columns or channels were set up with newspapers, radios, and television to inform the public of the latest progress of the Program.

5. Strategic implications of the Special Program

The Lanzhou Special Program is an emergent pollution control action launched under severe pollution situation, with evidently characters of “command-and-control” and “government-driven” approaches. The Program, itself, does not make any sense to be applied as reference. However, it implicates that under the situation of serious and hazardous pollution, command-and-control measures and the enforcement activities could often function to curb the worsening situation of pollution in a short time and achieve obvious effects, despite its high costs. In associated activities, it is very significant to have a powerful government, which can play a leading role from beginning to end. It shall not only initiate actions to control pollution, but also implement the plan by itself. This conclusion from Lanzhou experiences is also proved in international academia on comparative studies between command-and-control approaches and market-based-instruments.

The experience of Lanzhou indicates that legality of action (legal basis), special institutional arrangement, full cooperation among various governmental agencies and broad public participation are four essential elements to safeguard the success of the action, when it is necessary to undertake enforcement based on command-and-control approach.