

NORWAY

# NORWAY

## I. Policy and Legal Basis

The principle of the environmental policy of Norway is indicated by the following key words:

- suitable development, nationally and globally;
- precautionary principle;
- preventive action;
- international harmonization of environmental measures.

Regulatory measures at present provide the basic foundation for pollution control and environmental management in Norway. The legislative framework related to urban air pollution is the following:

- a) The Pollution Control Act (1981/1989). Control of industry through emission permits. Control of road traffic pollution through compliance with air quality guidelines.
- b) The Planning and Building Act (1985/1989), providing, for example, guidelines for municipal planning, transportation planning, environmental impact assessment.

The Ministry of Environment has the overall and political responsibility. It sets the targets, defines the policy and decides on the main priorities. Air quality guidelines were recommended by the State Pollution Control Authority in 1993. The NO<sub>x</sub> guidelines are considerably stricter than the WHO guidelines, based on recent indications of effects on health at low level exposure. Other acts of relevance to pollution control are the Municipality Health Service Act of 1982 and the Product Control Act of 1979.

## II. Scope of Each Network

The general purpose of the networks in Norwegian cities is to check air pollution concentrations, to follow the trends in air concentrations, to measure the exceedances of Norwegian recommended air quality guidelines and to measure the effects of different abatement measures carried out by the authorities. There are three *national* networks operated by the Norwegian Institute for Air Research (NILU): *Monitoring Programme for Long Range Transported Polluted Air and Precipitation*, *Monitoring Programme for Forest Damage*, *Monitoring Programme for Tropospheric Ozone*. Concerning the local air monitoring networks it is a joint responsibility between the Norwegian State Pollution Control Authority (SFT) and each of the six cities.

The following table gives an overview of the conditions of the *national* and *local* air monitoring networks in Norway.

| Network                       | LONG RANGE         | FOREST             | OZONE              | URBAN <sup>1)</sup>  |
|-------------------------------|--------------------|--------------------|--------------------|----------------------|
| Scale                         | National           | National           | National           | 6 Local              |
| Total number of sites, points | 7                  | 5                  | 11                 | 6                    |
| Pollutant/site nos            | SO <sub>2</sub> /7 | SO <sub>2</sub> /5 | O <sub>3</sub> /11 | SO <sub>2</sub> /1   |
|                               | SO <sub>4</sub> /7 | SO <sub>3</sub> /5 |                    | NO/6                 |
|                               | NO <sub>2</sub> /7 | NO <sub>2</sub> /5 |                    | NO <sub>2</sub> /6   |
|                               | NO <sub>3</sub> /7 | NO <sub>3</sub> /5 |                    | O <sub>3</sub> /1    |
|                               | NH <sub>3</sub> /7 | NH <sub>3</sub> /5 |                    | PM <sub>2.5</sub> /5 |
|                               |                    |                    |                    | PM <sub>10</sub> /6  |
|                               |                    |                    |                    | Benzene/1            |
|                               |                    |                    |                    | Toluene/1            |
| Measurement technique         | Sampling           | Sampling           | Automatic          | Automatic/sampling   |
| Type of sites                 |                    |                    |                    |                      |
| Urban                         |                    |                    |                    | 6                    |
| Suburban                      |                    | 1                  | 1                  |                      |
| Rural                         | 7                  | 4                  | 10                 |                      |

<sup>1)</sup> URBAN = Oslo, Bergen, Trondheim, Drammen, Skien, Porsgrunn

### **III. References**

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I. National Air Monitoring Network in: NORWAY

Name of Network: **MONITORING PROGRAMME FOR TROPOSPHERIC OZONE (Automatic Measurement)**

| Site Information |             |                                     | Monitoring Commenced<br>(etc.) | Pollutants<br>SO <sub>2</sub> , NO <sub>2</sub> , NO, CO, O <sub>3</sub> , TSP, etc. | Additional Information             |                                   |
|------------------|-------------|-------------------------------------|--------------------------------|--|------------------------------------|-----------------------------------|
| No.              | Name        | Type (rural, suburban, urban, etc.) |                                |  | Other Network Programmes Concerned | Remarks (Monitoring Agency, e.g.) |
| 1                | BIRKENES    | rural                               | 1985                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 2                | JERGUL      | rural                               | 1988                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 3                | KÅRVATN     | rural                               | 1988                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 4                | OSEN        | rural                               | 1990                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 5                | TUSTERVATN  | rural                               | 1989                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 6                | ZEPPELIN    | rural/arctic                        | 1989                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 7                | NORDMOEN    | suburban                            | 1986                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 8                | PRESTEBAKKE | rural                               | 1986                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 9                | SVANVIK     | rural                               | 1986                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 10               | VOSS        | rural                               | 1990                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
| 11               | JELØYA      | rural                               | 1981                           | O <sub>3</sub>   |                                    | NILU <sup>1)</sup>                |
|                  |             |                                     |                                |  |                                    |                                   |
|                  |             |                                     |                                |  |                                    |                                   |
|                  |             |                                     |                                |  |                                    |                                   |

<sup>1)</sup> NILU, Norwegian Institute for Air Research, Kjeller





**III. Local Air Monitoring Network in: NORWAY**  
**Name of Network: URBAN AIR QUALITY MONITORING NETWORK (Automatic/Sampling Measurement)**

| Measurement Information    |  |  |  |                      |  |
|----------------------------|--|--|--|----------------------|--|
| No. of the Monitoring Site | Pollutant  | Principle of Measurement                           | Measurement Device                                     | Integrating Interval |  |
| 1                          | SO <sub>2</sub>  |  |  |                      |  |
| 1, 2, 3, 5                 | NO, NO <sub>2</sub>                                      | Chemiluminescence                                  | Monitor Labs 8840                                      | 1 hour               |  |
| 4                          | NO, NO <sub>2</sub> , SO <sub>2</sub> , benzene, toluene | DOAS   | OP SIS   | 1 hour               |  |
| 6                          | NO <sub>2</sub>  | Impregnated filter, Na I (Alkaline)                | NILU automatic sampler (EK)                            | 24 hour              |  |
| 1, 2, 4                    | PM <sub>10</sub>   | Transversale TEOM conti.; Oscillating microbalance | RP 1400 A  | 1 hour               |  |
| 1                          | PM <sub>2.5</sub>  | Transversale TEOM conti.; Oscillating microbalance | RP 1400 A  | 1 hour               |  |
| 1, 2, 3, 5                 | PM <sub>10</sub> , PM <sub>2.5</sub>                     | Collection on filter                               | USA Sierra Instruments 245, OICHO                      | 24 hour              |  |
| 6                          | PM <sub>10</sub> , PM <sub>2.5</sub>                     | Collection on filter                               | NILU PM <sub>10</sub> , PM <sub>2.5</sub> sampler (EK) | 24 hour              |  |



POLAND

# POLAND

## I. Policy and Legal Basis

The fundamental current legal regulations on atmospheric air protection in Poland include:

- Act of 31 January 1980 on Environmental Protection and Management;
- Act of 20 July 1991 on the State Environmental Protection Inspectorate;
- Act of 14 March 1985 on the State Sanitary Inspectorate;
- Ordinance of the Minister of Environmental Protection, Natural Resources and Forestry of 12 February 1990 on the protection of air from pollution;
- Ordinance of the Council of Ministers of 27 February 1993 on the charges for the commercial use of, and modifications to, the environment;
- Ordinance of the Council of Ministers of 23 February 1987 on the amounts, principles, and procedures applied in imposing fines for the failure to comply with the requirements of environmental protection.

The legal regulations quoted above specify the following scopes of responsibilities for the monitoring of atmospheric air pollution:

- The duties of the State Sanitary Inspectorate include atmospheric air monitoring from the viewpoint of health and hygiene requirements, and supervision of the observance of the corresponding regulations;
- The duties of the State Environmental Protection Inspectorate include monitoring the condition of the environment, supervision of the observance of the regulations on environmental protection, and coordination of the national environmental monitoring system.

## II. Scope of Each Network

The networks operated in Poland are classified into national, regional and local according to the following criteria:

The *national* air quality monitoring network consists of the *General Monitoring Network* and *Basic Monitoring Network* stations. The specific objectives of those networks are described below.

- *The General Monitoring Network* is the largest nation-wide network. It has been supervised by the Institute of Occupational Medicine since 1992. The General Monitoring Network is subordinated to the Ministry of Health and Welfare, and is operated exclusively within the State Sanitary Inspectorate, following the provisions of the Act on State Sanitary Inspectorate of 14 March 1985. The Network is intended to serve the needs of the health monitoring system which is now being established in Poland. The aims of the network include measurements of pollutant concentrations in atmospheric air, considered as one of the factors affecting health conditions of the population. The main objective is to ensure that the measurements are performed in all

cities with a population above 20 thousand inhabitants (the actual number of the measuring stations in a specified city is dependent on the number of its inhabitants), and health resorts. The network is intended to rely on the manual 24 h-measurements. The basic pollutants to be determined include sulphur dioxide, nitrogen dioxide and black smoke, and, in cities above 50 thousand inhabitants, total suspended particulates. Depending on the specific requirements of a given region, other air pollutants characteristic of a given region are also determined (black smoke, fluorine, phenol and formaldehyde). In toto, 30 pollutants were determined in 1993. It should be noted that the network is in the process of being established, and it is largely based on the already existing measuring stations run by the State Sanitary Inspectorate. It is, therefore, impossible to specify a single date when monitoring started for all measuring stations. The General Monitoring Network data are collected and processed once a year; therefore the data specified refer to 1993.

- Following the Act of 20 July 1991 on the State Environmental Protection Inspectorate, a national network of the basic air pollution monitoring stations, which is coordinated by the State Environmental Protection Inspectorate, has been established. The measuring stations of the basic *National Network* are located both in urban and non-urban areas. The aim of that network is to assess air pollution conditions in Poland and determine the current trend in that respect. The list of the basic stations is not yet complete; the existing stations are being verified and new stations are being established where necessary. In 1995, the network comprises 89 measuring stations, and it is expected that 6 more stations will be included in 1995. Of this number, 18 are automatic stations, 4 belonging to this network only. The remaining stations are operated also as elements of the regional and/or local networks. 71 stations are manual; 34 of these stations belong to the General Monitoring Network, and the majority of the remaining stations are owned by the Voivodeship Environmental Protection Inspectorates. Four automatic and sampling stations are operated at the same time within the EMEP, and one within the HELCOM networks.

The primary purpose of the *regional* networks is to supply information on the concentrations of the individual air pollutants in a given region. The regional networks operated in the *Katowice* and *Kraków* regions, and single *OPSIS* stations are also classified as regional stations.

*Local* networks are established and financed by commercial companies on the basis of the decisions issued by the administration. Their aim is to provide information to the public on the current state of atmospheric air pollution in the vicinity of specified industrial plants, to assess and analyze the cases of excessive air pollution on a local basis, to evaluate the efficiency of atmospheric air pollution reduction programmes prepared by industrial plants. The Annex

describes the local *Kedzierzyn-Kozle Network*. There are more industrial networks of this type in Poland, but the detailed data on those networks are the property of the industrial plants. By way of example, Zaklady Azotowe in Wloclawek run a network which includes 9 measuring stations, Kopalnia Turów have 4 measuring stations, Huta Miedzi Legnica also have 4, Rafineria Gdaska - 3, Janikowskie Zaklady Sodowe - 3, Rafineria Plock - 2, and Kombinat Rudna have 2 measuring stations.

The following table gives an overview of the conditions of the *national, regional and local* air monitoring networks in Poland.

| Network                       | BASIC               | GENERAL              | REGIO <sup>1)</sup> | KK <sup>2)</sup>   |
|-------------------------------|---------------------|----------------------|---------------------|--------------------|
| Scale                         | National            | National             | 3 Regional          | Local              |
| Total number of sites, points | 16                  | 5546                 | 27                  | 6                  |
| Pollutant/site nos            | SO <sub>2</sub> /16 | SO <sub>2</sub> /509 | SO <sub>2</sub> /27 | SO <sub>2</sub> /6 |
|                               | NO/16               | NO <sub>2</sub> /332 | NO/19               | NO/6               |
|                               | NO <sub>2</sub> /16 | CO/5                 | NO <sub>2</sub> /27 | NO <sub>2</sub> /6 |
|                               | CO/13               | TSP/37               | CO/13               | CO/6               |
|                               | O <sub>3</sub> /10  | Dustfall/3976        | O <sub>3</sub> /15  | O <sub>3</sub> /6  |
|                               | TSP/2               | Black smoke/494      | TSP/1               | SPM/6              |
|                               | SPM/9               | VOC/16               | SPM/11              | HC/6               |
|                               | PM <sub>10</sub> /3 | H <sub>2</sub> S/6   | PM <sub>10</sub> /6 | NH <sub>3</sub> /3 |
|                               | Heavy metals/2      | Phenol/48            | Heavy metals/16     |                    |
|                               |                     | Fluoride/71          | VOC/8               |                    |
|                               |                     | HCHO/52              | HC/4                |                    |
|                               |                     |                      | PAH/4               |                    |
|                               |                     |                      | HCHO/2              |                    |
|                               |                     |                      | Phenol/1            |                    |
|                               |                     |                      | NH <sub>3</sub> /1  |                    |
| Measurement technique         | Automatic/sampling  | Sampling             | Automatic/sampling  | Automatic          |
| Type of sites                 |                     |                      |                     |                    |
| Urban                         | 11                  | 4405                 | 23                  | 1                  |
| Rural                         | 5                   | 1141                 | 4                   | 5                  |

<sup>1)</sup> REGIO = Katowice, Krakow, OPSIS

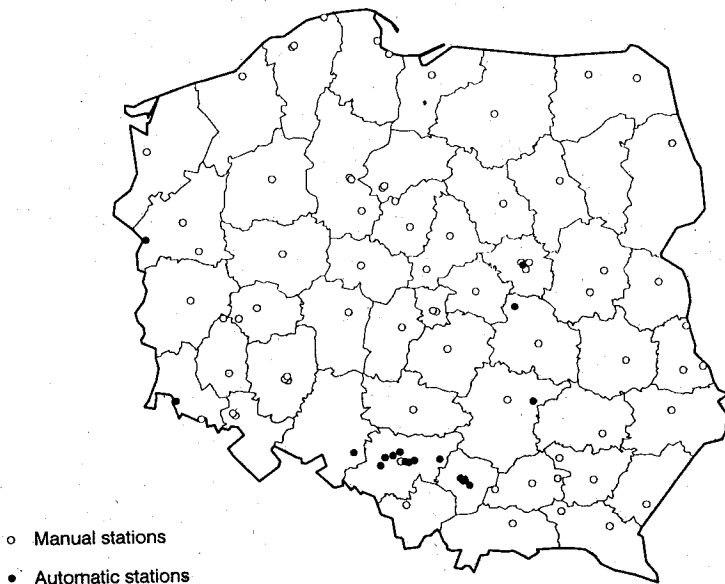
<sup>2)</sup> KK = Kedzierzyn-Kozle

### **III. Reference**

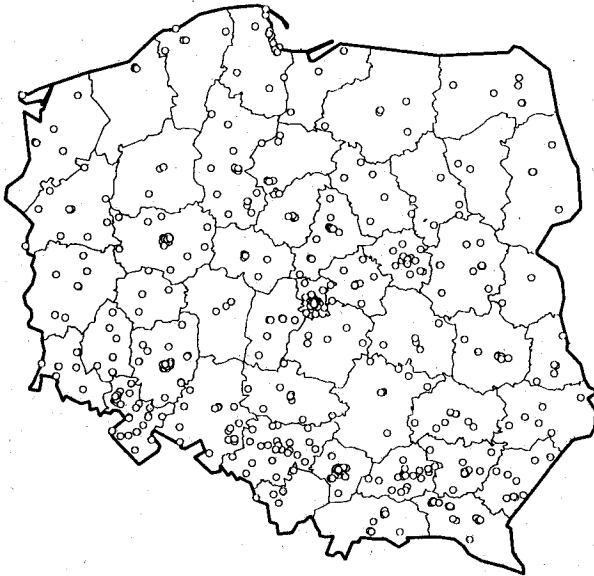
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**Map 1: National "BASIC" Air Monitoring Network in Poland**  
[Source: NOFER Institute of Occupational Medicine, 1995]



**Map 2: National "GENERAL" (SO<sub>2</sub> and SPM) Air Monitoring Network in Poland**  
[Source: NOFER Institute of Occupational Medicine, 1995]



**Map 3: Regional and Local Air Monitoring Networks in Poland**  
 [Source: NOFER Institute of Occupational Medicine, 1995]



**I. National Air Monitoring Network in: POLAND  
Name of Network: BASIC NATIONAL NETWORK (Automatic/Sampling Measurement)**

| Measurement Information    |                     |   |                           |                      |
|----------------------------|---------------------|---|---------------------------|----------------------|
| No. of the Monitoring Site | Pollutant           | Principle of Measurement                  | Measurement Device        | Integrating Interval |
| 1, 3                       | SO <sub>2</sub>     | UV-Fluorescence                           | Thermo Electron 43 A      | 1/2 hour             |
| 2                          | SO <sub>2</sub>     | UV-Pulse Fluorescence                     | Environment SA, AF 21 M   | 1/2 hour             |
| 4                          | SO <sub>2</sub>     | UV-Fluorescence                           | Horiba APOA - 350 E       | 1/2 hour             |
| 1, 3                       | NO, NO <sub>2</sub> | Chemiluminescence                         | Thermo Electron 42        | 1/2 hour             |
| 2                          | NO, NO <sub>2</sub> | Chemiluminescence                         | Environment SA, AC 30 M   | 1/2 hour             |
| 4                          | NO, NO <sub>2</sub> | Chemiluminescence                         | Horiba APNA - 351 E       | 1/2 hour             |
| 1                          | CO                  | Infrared-Photometry                       | Thermo Electron GFC CO 48 | 1/2 hour             |
| 4                          | CO                  | NDJR (non-dispersive infrared-absorption) | Horiba APMA - 350 E       | 1/2 hour             |
| 1, 3                       | O <sub>3</sub>      | UV-Photometry                             | Thermo Electron 49        | 1/2 hour             |
| 4                          | O <sub>3</sub>      | UV-Absorption                             | Horiba APOA - 350 E       | 1/2 hour             |
| 2                          | TSP                 | Gravimetric                               | Environment SA, PPA 60    | 24 hours             |
| 1                          | SPM                 | Beta Radiation-Absorption                 | FH 62 I-N                 | 1/2 hour             |
| 4                          | SPM                 | Beta Radiation-Absorption                 | Horiba APDA - 351 E       | 1/2 hour             |
|                            |                     |   |                           |                      |
|                            |                     |   |                           |                      |
|                            |                     |   |                           |                      |
|                            |                     |   |                           |                      |

**II. Regional Air Monitoring Network in: POLAND**  
**Name of Network: KATOWICE (Automatic/Sampling Measurement)**

| Site Information |   | Pollutants           |  | Additional Information             |                                   |
|------------------|---|----------------------|--|------------------------------------|-----------------------------------|
| No.              | Name<br>Type (rural, suburban, urban, etc.) | Monitoring Commenced | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, O <sub>3</sub> , TSP, etc.             | Other Network Programmes Concerned | Remarks (Monitoring Agency, s-g.) |
| 1                | KATOWICE<br>urban                           | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, O <sub>3</sub> , SPM, HC <sup>7)</sup> | Basic National Network             | VOK <sup>1)</sup>                 |
| 2                | CHORZOW<br>urban                            | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, SPM                                    |                                    | VOK <sup>1)</sup>                 |
| 3                | BYTOM<br>urban                              | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, SPM                                    | Basic National Network             | VOK <sup>1)</sup>                 |
| 4                | ZABRZE<br>urban                             | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, O <sub>3</sub> , SPM, HC <sup>7)</sup> | Basic National Network             | VOK <sup>1)</sup>                 |
| 5                | GLIWICE<br>urban                            | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, SPM                                    | Basic National Network             | VOK <sup>1)</sup>                 |
| 6                | PIEKARY SLASKIE<br>urban                    | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , SPM  |                                    | VOK <sup>1)</sup>                 |
| 7                | BEDZIN-WOJKOWICE<br>rural                   | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, SPM                                    |                                    | VOK <sup>1)</sup>                 |
| 8                | SOSNOWIEC<br>urban                          | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , SPM  | Basic National Network             | VOK <sup>1)</sup>                 |
| 9                | KUZINA NIEBOROWSKI<br>rural                 | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, O <sub>3</sub> , SPM, HC <sup>7)</sup> | Basic National Network             | VOK <sup>1)</sup>                 |
| 10               | SLAWKOW<br>rural                            | Apr 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, SPM                                    |                                    | VOK <sup>1)</sup>                 |
| 11               | OLKUSZ<br>urban                             | Jul 1993             | SO <sub>2</sub> , NO, NO <sub>2</sub> , CO, O <sub>3</sub> , SPM, HC <sup>7)</sup> | Basic National Network             | CCOO <sup>2)</sup>                |
| 12               | KATOWICE-ZADOLE<br>rural                    | Jan 1992             | SO <sub>2</sub> , NO, NO <sub>2</sub> , O <sub>3</sub> , TSP <sup>7)</sup>         | Basic National Network             | FRIK <sup>3)</sup>                |

<sup>7)</sup> aliphatic hydrocarbons

<sup>7)</sup> chemical composition of suspended matter: heavy metals (Pb, Cd, Zn, Cu, Cu)

<sup>1)</sup> VOK, Voivodeship Office Katowice; <sup>2)</sup> CCOO, City and Community Office Olkusz; <sup>3)</sup> FRIK, Forest Research Institute Katowice





**II. Regional Air Monitoring Network in: POLAND**  
**Name of Network: KRAKOW (Automatic/Sampling Measurement)**

| Measurement Information    |                     |                           |                            |                      |
|----------------------------|---------------------|---------------------------|----------------------------|----------------------|
| No. of the Monitoring Site | Pollutant           | Principle of Measurement  | Measurement Device         | Integrating Interval |
| 1 to 7                     | SO <sub>2</sub>     | UV-Fluorescence           | Thermo Electron 43A        | 1/2 hour             |
| 1 to 7                     | NO, NO <sub>2</sub> | Chemiluminescence         | Thermo Electron 42         | 1/2 hour             |
| 1, 3, 5, 6                 | CO                  | Infrared-Absorption       | Thermo Electron 48         | 1/2 hour             |
| 1, 7                       | O <sub>3</sub>      | UV-Absorption             | Thermo Electron 49         | 1/2 hour             |
| 1 to 6                     | PM <sub>10</sub>    | Beta Radiation-Absorption | FH 62 I-N                  | 1/2 hour             |
| 2, 3, 5, 6                 | heavy metals        | AAS                       | Smith-Hierfje 21/22 Thermo | 24 hours             |
| 2, 3, 5, 6                 | benz[a]pyren        | TLC                       | CAMAG                      | 24 hours             |





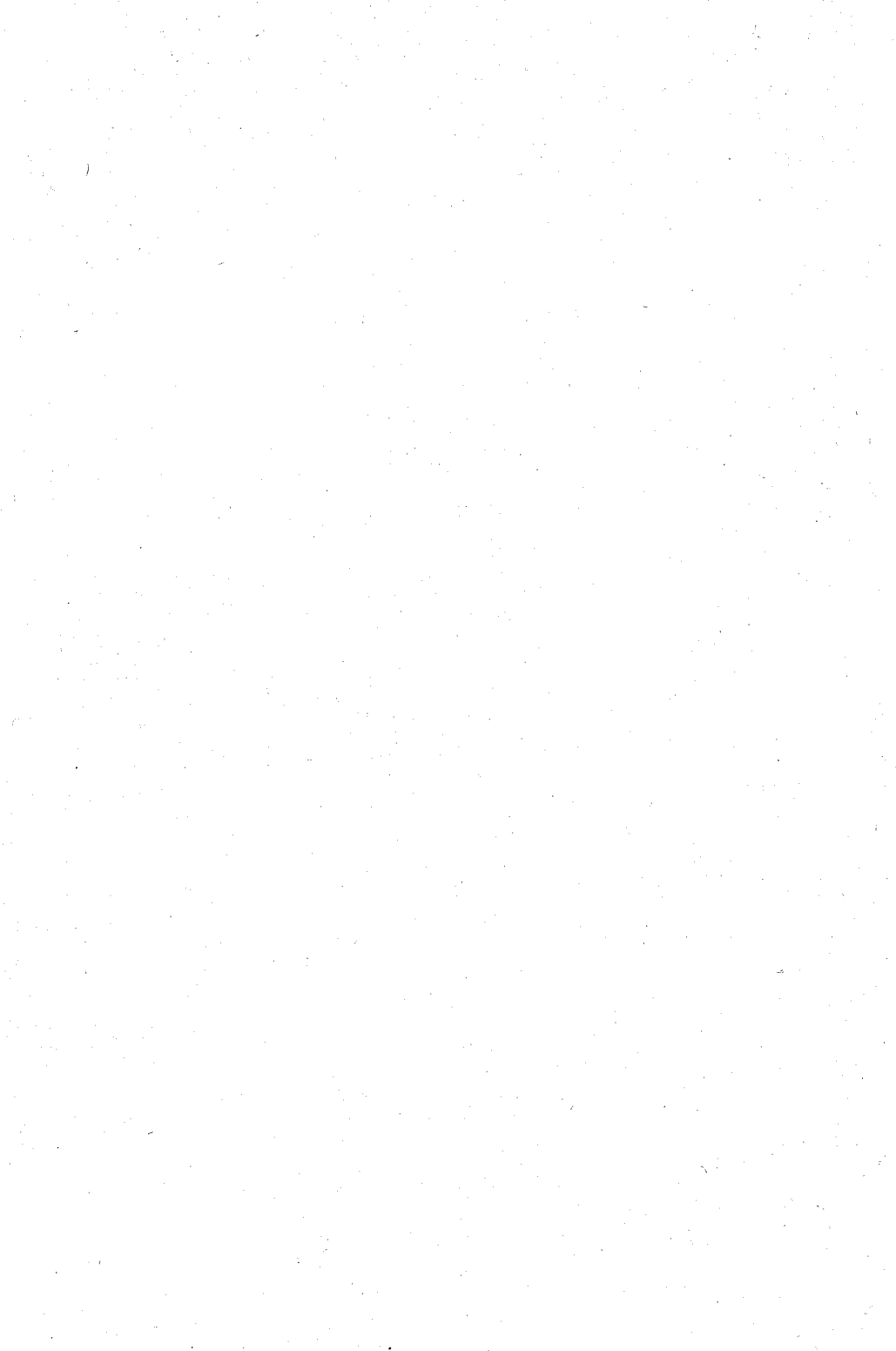




**I. National Air Monitoring Network in: POLAND  
Name of Network: GENERAL MONITORING NETWORK (Sampling Measurement)**

| Monitoring Information                      |   |   | Sampling Information |   |                                    | Additional Information                                   |                                    |                                   |
|---|---|---|----------------------|---|------------------------------------|--|------------------------------------|-----------------------------------|
| Number of Sampling Points (n <sup>1</sup> ) | Distribution of Sampling Points (Irregular (n <sup>1</sup> )) | Size of Monitored Area (km <sup>2</sup> ) | Pollutant            | Sampling Concept<br>a = permanent<br>b = for a limited period | Time Interval for Sampling (hours) | Number of Samplings per Point and Year (n <sup>1</sup> ) | Other Network Programmes Concerned | Remarks (Monitoring Agency, e.g.) |
| 509   | 509   | 3860                                      | SO <sub>2</sub>      | a   | 24 hours                           | 179  | GEMS (6 points)                    | VSS <sup>1)</sup>                 |
| 332   | 332   | 2994                                      | NO <sub>2</sub>      | a   | 24 hours                           | 160  | GEMS (6 points)                    | VSS <sup>1)</sup>                 |
| 5   | 5   | 20  | CO                   | a   | 24 hours                           | 69   |                                    | VSS <sup>1)</sup>                 |
| 37  | 37  | 349                                       | TSP                  | a   | 24 hours                           | 81   |                                    | VSS <sup>1)</sup>                 |
| 3976  | 3976  | 14976                                     | dustfall             | a   | 1 month                            | 11   |                                    | VSS <sup>1)</sup>                 |
| 16  | 16  | 213                                       | VOCs                 | a   | 24 hours                           | 164  |                                    | VSS <sup>1)</sup>                 |
| 6   | 6   | 68  | H <sub>2</sub> S     | a   | 24 hours                           | 133  |                                    | VSS <sup>1)</sup>                 |
| 494   | 494   | 4086                                      | Black Smoke          | a   | 24 hours                           | 196  | GEMS (6 points)                    | VSS <sup>1)</sup>                 |
| 48  | 48  | 266                                       | phenol               | a   | 24 hours                           | 123  |                                    | VSS <sup>1)</sup>                 |
| 71  | 71  | 735                                       | fluoride             | a   | 24 hours                           | 154  |                                    | VSS <sup>1)</sup>                 |
| 52  | 52  | 915                                       | HCHO                 | a   | 24 hours                           | 141  |                                    | VSS <sup>1)</sup>                 |

<sup>1)</sup> VSS, Voivodeship Sanitary Stations





**SLOVENIA**

# SLOVENIA

## I. Policy and Legal Basis

Until June 1993 measurements of air pollution were performed as laid down by the 1975 Air Protection Act, amended in 1979. At a later date, the new Environmental Protection Act was passed, in which the field of air protection is regulated in an up-to-date way. Following the adoption of that act, preparations were started for several by-laws to be adopted which will regulate the field of air pollution in a more detailed manner. These activities continued throughout the entire year of 1993. According to the Organization and Scope of Activity of the State Administration Act, the Hydrometeorological Institute of Slovenia (HMZ) was incorporated into the Ministry of the Environment and Physical Planning (MOP) in 1993. The tasks of the HMZ in the field of air protection will be defined in greater detail by the by-laws to the Environmental Protection Act, currently under preparation [Planinsek, 1994].

The new Environmental Protection Law introduces verification of monitoring quality. Quality assurance will involve checking the quality of measurements, implementation of methodologies, competence of personnel and the quality of equipment of the monitoring implementors.

Regulations on the rehabilitation measures considering air pollution have been in use since September 1989 and form a good base for planning the move to improve air quality in this country [Hrcek, 1992].

## II. Scope of Each Network

The HMZ has performed regular measurements of air pollution since 1968. Its tasks, related to air pollution, were laid down by the Air Protection Law. According to that Law, the HMZ performs the following important tasks:

- establishing and the professional monitoring of general air pollution, emission and spreading of air pollution;
- presenting data on air pollution to the public;
- supplying data for classifying regions in Slovenia as to the degree of air pollution, preparing data for drawing up rehabilitation programmes and preventive measures as well as supplying data for implementation of emergency measures.

The HMZ performs the above mentioned tasks on the basis of the measurements carried out within the framework of the national basic air quality monitoring network, set up to cover the entire territory of Slovenia.

According to the provisions of the Law on Air Protection, most of the present sites of the basic monitoring network were established between 1976 and 1977. Initially, the network included measuring sites for defining pollution from sulphur dioxide and black smoke by the standard analytical method. After 1980, several sites were established to also monitor the pollution of precipitation. From 1983

on, the construction of a monitoring network of automated stations for measuring air pollution and some meteorological parameters has been established. Automated monitoring stations are an important part of the *national Basic Air Quality Monitoring Network – ANAS* (analytical monitoring alarm system for air protection). They resumed their original alarm function after 1988 when they were gradually linked to the system for releasing half-hourly data to the computer centre at HMZ.

The complementary network, based on the *regional and local networks Celje and Maribor*, as well as *EIS TES, EIS TET, EIS TE-TOL*, comprises regular measurements of air pollution, performed by various independent institutes. In general, the measurements are conducted according to the methods of the basic network. The data from the Slovenian networks are to be compiled in the national information system.

Each year, measurements of the *SO<sub>2</sub> and Black Smoke Network* classifies localities according to the average concentration in the heating season, separately for SO<sub>2</sub> and black smoke. Monitoring sites are classified as to the basic and complementary networks mentioned above.

The following table gives an overview of the conditions of the *national, regional and local* air monitoring networks in Slovenia.

| Network                       | ANAS               | SO <sub>2</sub> /BLACK SMOKE | CELJE-MARIBOR      | EIS <sup>1)</sup>   |
|-------------------------------|--------------------|------------------------------|--------------------|---------------------|
| Scale                         | National           | National                     | Regional           | 3 Local             |
| Total number of sites, points | 8                  | 66                           | 2                  | 11                  |
| Pollutant/site nos            | SO <sub>2</sub> /7 | SO <sub>2</sub> /66          | SO <sub>2</sub> /1 | SO <sub>2</sub> /11 |
|                               | NO/3               | Black smoke/66               | NO/1               | NO/3                |
|                               | NO <sub>2</sub> /3 |                              | NO <sub>2</sub> /1 | NO <sub>2</sub> /3  |
|                               | CO/2               |                              | CO/2               | O <sub>3</sub> /3   |
|                               | O <sub>3</sub> /2  |                              | O <sub>3</sub> /1  |                     |
|                               | TSP/2              |                              | TSP/2              |                     |
|                               |                    |                              | HC/1               |                     |
| Measurement technique         | Automatic          | Sampling                     | Automatic          | Automatic           |
| Type of sites                 |                    |                              |                    |                     |
| Urban                         | 7                  |                              | 2                  | 2                   |
| Suburban                      |                    |                              |                    | 1                   |
| Rural                         | 1                  |                              |                    | 8                   |

<sup>1)</sup> EIS = EIS TES, EIS TET, EIS TE-TOL

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### **National Collaborator**

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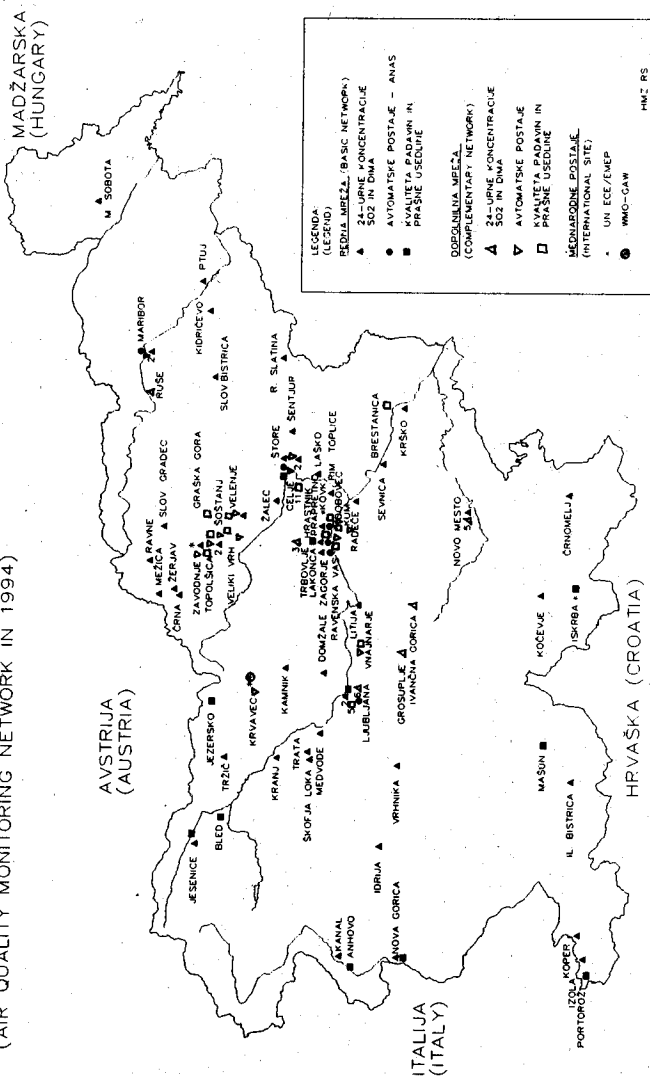
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MERILNA MESTA ZA SPREMLJANJE ONESNAŽENOSTI ZRAKA V LETU 1994  
 (AIR QUALITY MONITORING NETWORK IN 1994)



**Map 1: National Air Monitoring Networks in Slovenia**  
 [Source: Hydrometeorological Institute of Slovenia, 1994]







**II. Regional Air Monitoring Network in: SLOVENIA**  
**Name of Network: CELJE - MARIBOR (Automatic Measurement)**

| Measurement Information    |                     |                           |                         |          |
|----------------------------|---------------------|---------------------------|-------------------------|----------|
| No. of the Monitoring Site | Pollutant           | Principle of Measurement  | Measurement Device      |          |
|                            |                     |                           | Integrating Interval    |          |
| 1                          | SO <sub>2</sub>     | UV-Fluorescence           | Monitor Labs 8850, 9850 | 1/2 hour |
| 1                          | NO, NO <sub>2</sub> | Chemiluminescence         | Monitor Labs 8840, 9841 | 1/2 hour |
| 1, 2                       | CO                  | Infrared-Absorption       | Monitor Labs 8830, 9830 | 1/2 hour |
| 1                          | O <sub>3</sub>      | UV-Absorption             | Monitor Labs 8810, 9810 | 1/2 hour |
| 1                          | TSP                 | Oscillating microbalance  | TEOM 1400               | 1/2 hour |
| 2                          | HC                  | Chromatography, FID       | Varian                  | 1/2 hour |
| 2                          | TSP                 | Beta radiation-Absorption | FAG FH 621 - N          | 1/2 hour |













**I. National Air Monitoring Network in: SLOVENIA  
Name of Network: SO<sub>2</sub> and BLACK SMOKE (Sampling Measurement)**

| Monitoring Information                      |   | Sampling Information                      |                      |                             | Additional Information  |                                    |  |                                    |   |
|---|---|---|----------------------|-----------------------------|---|------------------------------------|--|------------------------------------|---|
| Number of Sampling Points (n <sup>1</sup> ) | Distribution of Sampling Points (n <sup>1</sup> ) | Size of Monitored Area (km <sup>2</sup> ) | Monitoring Commenced | Pollutant                   | Sampling Concept<br>a = permanent<br>b = for a limited period | Time Interval for Sampling (hours) | Number of Samplings per Point and Year (n <sup>2</sup> ) | Other Network Programmes Concerned | Remarks (Monitoring Agency, e.g.)   |
| 66  |   | 20256                                     |                      | SO <sub>2</sub>             | a   | 07:01 - 07:00                      | ~ daily  |                                    | HMZ <sup>1)</sup> , ZZV-CE <sup>2)</sup> , ZZV-MB <sup>3)</sup> , MVE <sup>4)</sup> |
|   |   |   |                      | NO                          |   |                                    |  |                                    |   |
|   |   |   |                      | NO <sub>2</sub>             |   |                                    |  |                                    |   |
|   |   |   |                      | CO                          |   |                                    |  |                                    |   |
|   |   |   |                      | O <sub>3</sub>              |   |                                    |  |                                    |   |
| 66  |   | 20256                                     |                      | Black Smoke                 | a   | 07:01 - 07:00                      | ~ daily  |                                    | HMZ <sup>1)</sup> , ZZV-CE <sup>2)</sup> , ZZV-MB <sup>3)</sup> , MVE <sup>4)</sup> |
|   |   |   |                      | Dustfall                    |   |                                    |  |                                    |   |
|   |   |   |                      | VOC (Benzene, Toluene etc.) |   |                                    |  |                                    |   |
|   |   |   |                      | Aerosols                    |   |                                    |  |                                    |   |

<sup>1)</sup> HMZ, Hydrometeorological Institute of Slovenia, Ljubljana

<sup>2)</sup> ZZV-CE, Celje Public Health Institute, Celje

<sup>3)</sup> ZZV-MB, Maribor Public Health Institute, Maribor

<sup>4)</sup> MVE, Milian Vidmar Electrolinstitute