COMMUNICATING AIR QUALITY TO THE PUBLIC AS A TOOL TO RAISE AWARENESS OF AIR POLLUTION ISSUES

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Abstract

The paper labours reasons for broadening communication of air quality measurements to the general public in the present-day Czech Republic. A more direct reporting of current air pollution records, on both nationwide and local scale, is requisite to draw closer attention to air quality as one of the major clues to maintain sustainable environment.

KEY WORDS: air quality index, public awareness, Czech Republic

1. INTRODUCTION

Air quality in the Czech Republic has undergone major changes in the last fifteen years. Industrial air pollution decreased due to general reduction in the production volumes, closing down of many businesses and sheer modernizing of plants that continue operation. A significant reduction in emissions of sulphur dioxide (SO_2) was faciliated by desulphurising flue gases emitted from brown-coal power plants (programme completed by 1997). Commencing the Temelín nuclear power plant (in 2002) also allowed reducing the dependency of the Czech energy market on burning fossil fuels. Local heating patterns shifted from coal in favour of natural gas and electricity – according to the air pollution report of the Czech Hydrometeorological Institute (2005) solid fuels were used for heating in 19% of flats in the country in 2004 compared to 45% in 1991, while the share of gas fuels raised from 16% to 36% and electricity from 1% to 6% in the same period. The share of district heating remained almost the same (37% in 1991, 38% in 2004). A significant drop in the use of solid fuels in local heating occurred in the 1990s, since then the share remains stable and still comprises a significant group of consumers. The costs of gas and electricity heating have been growing fast in the recent years and there is indication that the widening gap in prices of fuels may persuade part of the consumers to migrate from gas and electricity back to coal and wood. Another indicator describing the rising importance of individuals in air pollution issues is the number of vehicles used in the country. According to yearbooks published by the Czech Statistical Office there

were around 2.7 million passenger cars (including vans) in the Czech Republic in 1993 and more than 3.8 million in 2004.

2. AIR QUALITY INDEX AND ITS MODIFICATIONS

Air quality monitoring uses various environmental indicators. Besides air pollution levels for specific airborne pollutants in a given location the so called **air quality index** (AQI) has been defined as a more complex report tool on air pollution.

Numerous modifications of AQI have been derived based on various data sets of air pollution levels, primarily concerning the effect of airborne pollutants on human health.

2.1. AQI in the Czech Republic

In the Czech Republic, air quality index ('index kvality ovzduší' in Czech, abbreviated as IKO) has been proposed for air quality assessment since the beginning of 1980s. The very early version of this indicator was published by the Ministry of Health in 1981, but it faced criticism, did not encounter wider practical use and has finally been abandoned (Hůnová, Janoušková, 2004).

The National Institute of Public Health (Státní zdravotní ústav) has developed an air quality index based on annual, daily and instant concentration values. This IKO has been used in recent years as part of the annual reports on health impacts of air pollution. Any airborne pollutant with a designated national limit may be assessed by this IKO. It is also possible to derive IKO values for any selected group of pollutants. The calculated IKO values are classified into colour-coded, verbally described levels on a scale of one to six (Table 1).

Table 1: Air quality index (IKO) of the Czech National Institute of Public Health

IKO		Description	Colour
value	level		
<0; 1)	1	clean air, health favourable	fresh green
<1; 2)	2	satisfactory air, healthy	dim yellowish green
<2; 3)	3	slightly polluted air, health acceptable	dim yellow
<3; 4)	4	polluted air, endangering health of sensitive persons	dim ochre
<4; 5)	5	heavily polluted air, endangering health of the whole population	dim red
<5; 6)	6	air harmful to health, very heavily polluted	bright crimson

Source: Postup výpočtu indexu kvality ovzduší. Státní zdravotní ústav.

The Czech Hydrometeorological Institute derived a different air quality index and used it to classify the area of the Czech Republic into five categories according to air pollution levels confronted with air pollution limits. Outputs of this assessment were published in the annual reports in 1997–2002 (Hůnová, Janoušková, 2004) but this was abandoned after the adoption of the new air quality legislation.

2.2. Selected examples of AQI from abroad

The **U.S. EPA** uses AQI as a key tool for reporting daily air quality. The original Pollutant Standards Index (PSI), used since 1976 to label local air quality within newspaper reports, was revised and renamed as AQI in 1999. The indicator is defined on a scale from 0 to 500 divided into six intervals, colour-coded for the ease of perception of the health concern (Table 2). An AQI value of 100 corresponds to the national air quality standard for the specific pollutant. EPA calculates the AQI for five major air pollutants regulated by the U.S. Clean Air Act: ground-level ozone, particulate matter, carbon monoxide, sulphur dioxide, and nitrogen dioxide. In large cities (more than 350,000 people), state and local agencies are required to report the AQI to the public daily. When the AQI is above 100, agencies must also report which groups in population may be sensitive to the specific pollutant. Many smaller communities also report the AQI as a public health service. Many cities even provide forecasts for the next day's AQI. Information on AQI is broadcasted within local television and radio weather forecasts, reported in local newspapers and posted on the Internet (http://www.airnow.gov/).

Table 2: US EPA Air Quality Index categories

AQI range	Health Concern	Colour
0 to 50	good	green
51 to 100	moderate	yellow
101 to 150	unhealthy for sensitive groups	orange
151 to 200	unhealthy	red
201 to 300	very unhealthy	purple
301 to 500	hazardous	maroon

Source: Air Quality - A Guide to Air Quality and Your Health. U.S. EPA.

In **Portugal**, an AQI for major urban areas has been developed for daily reports on air quality (Ferreira et al., 2002). The classification is based on the worst daily concentration of particulate matter (PM_{10}), the worst 8-h concentration of carbon monoxide, and the worst hourly concentrations of nitrogen dioxide, sulphur dioxide and ground-level ozone. For each of the five pollutants its worst average is classified on a scale of five AQI categories (very good – good – medium – weak – bad). Information on AQI is published daily at 17.00 h based on data from midnight to 15.00 h. Ferreira (2002) proves this AQI to successfully reflect high pollution levels found according to European legislation and to serve as a useful tool to provide better public information and awareness.

A simple AQI was developed in 1993 for the Helsinki Metropolitan Area, **Finland** in order to inform the public in layman's terms about the current air pollution situation (Hämekoski, 1998). The index was required to be simple to calculate, clear enough for the public to understand, yet still have a sound scientific basis. The pollutants included in the calculation are carbon monoxide (1-h and 8-h concentration), nitrogen dioxide (1-h and 24-h), sulphur dioxide (1-h and 24-h), ground-level ozone (1-h) and particulate matter expressed as PM_{10} (1-h). Subindices are calculated hourly for all pollutants and for the given hour the highest subindex becomes the AQI. Moving averages are used for 8-h and 24-h averages. The AQI calculation is based on a segmented linear function consisting of four breakpoints (AQI of 10, 50, 100, and 150) joined by straight-line segments. The AQI level of 100 corresponds to the pollutants' concentration limits according to the Finnish air quality guidelines (except for O_3, assessed due to lack of the national standard on the basis of WHO recommendation). For easier public understanding the AQI levels are segmented into four colour-coded categories (Table 3). When the air pollution situation changes very fast, the subindices based on 24-h averages can still determine AQI value even though the concentration of the pollutant in question has already dropped. This temporary disagreement of the AQI with real-time air quality lasts only a few hours and the value is correct as far as potential 24-h exposure of city dwellers is concerned. A direction of the change of the AQI may be added to the instant figure in order to control the reverberation phenomenon.

Table 3: AQI categories – Helsinki, Finland

AQI range	Definition	Colour
< 50	Good	Green
51–100	Fair	Yellow
101–150	Passable	Orange
> 150	Poor	Red

Source: Hämekoski, K. (1998).

Many other examples of AQI can be found all around the world, including both developed and developing countries. The prevailing principle is to confront the current air pollution levels of the most common health-affecting airborne pollutants against their national standards and to transform this information into an easily understandable index that can be directly reported to general public on a regular, preferably daily basis.

3. DISCUSSION

At present, the Czech mass media cover air quality issues mainly by individual, irregular reports on local air pollution accidents, summaries of seasonal or annual assessment studies and other similar topics. Although weather forecasts are an integral part of everyday television and radio broadcast on both national and local levels, as well as they

are published in newspapers and posted on news websites, air quality reporting is not contained unless warning on high pollution levels or smog regulation is necessary. The public service weather forecast on the Česká televize channel contains regular prediction of the following day's air pollutant dispersion conditions; the TV weather forecasts prepared by Meteopress uses a specific air quality prediction index (scale 1–10). None of these short communications contain a real, current air quality assessment report. In the early 1990s a former Czech public service TV channel OK3 broadcasted real-time air pollution levels from selected areas of the country (northern Bohemia, northern Moravia, Prague etc.) but this practise was abandoned with the transformation of TV broadcasting after the split of Czechoslovakia.

Air pollution monitoring in the Czech Republic uses a relatively dense network of monitoring stations, including automated ones. Data from this network are available in close-to-real time, all the basic airborne pollutants are covered according to the requirements of national legislation which has come into accordance with EU Directives at the process of the Czech Republic joining the European Union. Availability of data on current air pollution levels is therefore comparable to countries where regular air quality reporting has become standard.

While large industrial sources are obliged to follow strict air pollution regulations according to the Czech legislation, individuals do not have to carry out specific emission regulations (apart from proper combustion source installation and vehicle maintenance). The responsibility of individuals for their emissions of airborne pollutants should be supported by proper information in order to raise the awareness of air quality issues. The practice of regular communicating of air quality to general public is technically easy to implement and adopting such service would draw attention of public to air pollution prevention. A simple, easy to report air quality index shall be calculated at least for the larger urban areas in the country to be broadcasted on a daily basis within the weather forecast, as well as newspapers and news websites. Local municipal authorities may also take action in the similar way, offering the local value of AQI to local media (local television channels, regional news broadcast within the national television channels, local and regional radio stations, local and regional press, municipal and regional websites etc.).

4. CONCLUSIONS

Sufficient information on environmental issues is necessary to support public consciousness about pollution prevention. The necessary data are already available from expert institutions nationwide. Regular reporting of a simple air quality index on both national and local levels is likely to raise attention of the small, individual producers of airborne pollutants. The daily basis of the reporting and its nature as a standard part of the news content or weather forecast is the primary concept of making air-quality awareness an integral part of everyday decision making.

5. SOUHRN

Sdělování kvality ovzduší veřejnosti jako nástroj ke zvýšení povědomí o problémech znečištění ovzduší.

Kvalita ovzduší je v České republice legislativně ošetřena v souladu se zvyklostmi vyspělých zemí a požadavky Evropské unie. Síť sledování kvality ovzduší poskytuje dostatečná data pro zpracování jednoduchého a laikům snadno pochopitelného indexu kvality ovzduší, který by se mohl stát nedílnou součástí obsahu zpravodajství či informací o stavu a předpovědi počasí na celostátní i regionální či místní úrovni. Obdobná informační služba je běžná v řadě vyspělých zemí a ani v České republice jejímu zavedení nestojí v cestě závažnější technické překážky. Pravidelné informování široké veřejnosti o aktuálním stavu kvality ovzduší, ať už na celostátní nebo místní úrovni, by pozvedlo povědomí občanů coby soukromých provozovatelů malých a mobilních zdrojů znečišťování ovzduší a obzvlášť s doprovodným upozorněním na účinky na lidské zdraví by se mohla stát jedním z efektivních nástrojů prevence znečišťování atmosféry.

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