LEGISLATION ON THE ASSESSMENT OF PUBLIC HEALTH RISKS ASSOCIATED WITH THE AMBIENT AIR QUALITY IN THE REPUBLIC OF BELARUS[1]

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Abstract. The sanitary regulations, codes and hygienic standards have been brought up to date with the international regulations, guidelines and responsibilities of the Republic of Belarus under the international conventions. Maximum permissible concentrations (PDK 653) are set as state standards in Belarus. They are divided into several groups based on duration – maximum one-time, daily average, annual average and safe reference levels of impact (1424 OBUV) that include 17 pollutants of identified hazard classes. A software solution has been developed to assess public health risks associated with the air quality through determination of the optimum size of the sanitary protection zones in accordance with the provisions of the User Manual for the Assessment of Public Health Risks Under Environmental Exposure adopted by the Deputy Minister of Health of the Republic of Belarus, 08/06/2012, registered under #025-1211.
Key words: air, pollutants, software solution, risk assessment.

One of the public health priorities in the Republic of Belarus is prevention that includes the development and primary implementation of activities aimed at prevention, early detection, disease risk reduction and identification of disease causes and conditions with the account for the environmental exposure.

Under the Law of the Republic of Belarus On the sanitary and epidemiological well-being of the population #340-3 of 7/1/2012, the state disease control and prevention inspection has the following objectives:

Comprehensive assessment of the environmental impact on the sanitary and epidemiological conditions, life and health of the population;

Prevention of harm to the life and health of the population posed by the facilities that are subject to the state disease control and prevention inspection

State sanitary inspection is mandatory for the health protection zones of the organizations, buildings and other facilities that have an impact on public health and the environment as identified by the Ministry of Health of the Republic of Belarus (Article 16. State Sanitary and Hygienic Inspection). Article 41 declares that the Chief State Medical Officer has a right “to put the authorities and establishments that are part of the Ministry of Health of the Republic of Belarus in charge of inspections and consultations on the assessment of public health under the habitat factors”.

Risk evaluation is a series of procedures regulated by the guidelines of the Ministry of Health of the Republic of Belarus that determine the probability of unfavorable changes in health under environmental exposure.

Intensification of industrial and agricultural construction and civil engineering in view of rational land use determines the necessity for risk evaluation under exposure to air and noise

[1] *Translated by Ksenya Zemnlyanova*

pollution caused by industrial discharges and emissions. To create favorable living conditions, an environmental model of a residential area should include rational functional zoning of an urban territory with an accent on sanitary protection zones. According to the sanitary norms, rules and regulations "Hygienic Requirements to Sanitary Protection Zones at the Organizations, Buildings and Other Facilities That Expose the Population and the Environment to Harmful Agents" approved by the Resolution № 11 (section 10) of the Ministry of Health of the Republic of Belarus on 10/02/2011, the area of a sanitary protection zone of a designed facility is determined on the basis of a sanitary protection zone design project that includes the calculations of atmospheric dispersion, physical impact and health risks associated with the air emissions by the facility. The importance of early reporting of a negative environmental impact on human health makes it necessary to develop the most time effective risk evaluation methods that would allow obtaining credible risk assessment data for an adequate management decision within the shortest possible period of time and the least financial resources [1]. This fact makes it necessary to develop a faster procedure for IT-based evaluation of public health risks associated with the air quality. A software solution has been developed to evaluate public health risks associated with the air quality by means of determining sufficient dimensions of a sanitary protection zone following the regulations provided by the Environmental Exposure Assessment Methods Manual № 025-1211 of 08/06/2012 approved by the Deputy Minister of Health of the Republic of Belarus.

The above Manual was developed within task 06.01 'To develop and implement a comprehensive methodology to assess public health risks associated with the air quality in preparation for a preliminary sanitary inspection" in accordance with the basic technological design standards "Health and the Environment". Hygienic assessment of ambient air pollution is based on the average daily and the maximum one-time concentration including the calculation of the integrated pollution indicator and determination of a risk level in accordance with the public health grading presented in the table below [1].

A comprehensive reporting and analytic risk assessment system includes an electronic database that contains data on the public health risks associated with the priority chemical substances. The system is made up of a set of files that contain the toxicologic and hygienic characteristics of the priority chemical pollutants and associated hygienic regulations - maximum permissible concentrations, hazard group, and the type of damage to organs and systems. Supporting documentation includes: an alphabetized list of chemical files (each chemical is assigned a Chemical Abstracts Service (CAS) number); description of provisions and methods; Manual with a detailed description of procedures and examples; glossary of terms, definitions and acronyms associated with the risk assessment methodology [2, 3].

Public health and risk level grading based on the level of ambient air pollution

Level of Ambient Air Pollution	Risk Level	Public Health Grading	Priority of Action
Hazardous V	1 : 1000 10^{-3} (E-03)* The risk is considered impermissible	Adaptation failure (exceeds the background incidence rate of a disease by several times)	High priority. Emergency action needed to lower the risk level
High IV	1 : 10 000 10^{-4} (E-04)* The risk is considered unacceptable	Adaptation overstressing (significant excess of the upper limit of the background incidence rate)	High priority. Hazard identification, health risk assessment and taking emergency actions to lower the risk level
Moderate III	1 : 100 000 10^{-5} (E-05)* The risk is considered rather high	Adaptation stress (significant excess of the background incidence)	Average priority. Hazard identification and making decisions regarding lowering the risk level
Low II	1 : 1 000 000 10^{-6} (E-06)* Acceptable risk level	Compensation/ resistibility (background incidence rate)	Low priority. Current risk management system. Additional measures are not required
Permissible I	1 : 10 000 000 10^{-7} (E-07)* Acceptable risk level	Adaptation (background incidence rate)	Low priority. Current risk management system Additional measures are not required

Automated calculations and risk assessment methods have been developed to evaluate non-carcinogenic health effects (potential risk of reflexive and chronic action, hazard indices and coefficients); carcinogenic effects; and risks associated with priority pollutants and their impact on the main organs and systems (nervous system, respiratory system, cardiovascular system, circulatory system, and the body development processes). A software solution called "Computer-based reporting and evaluation system to assess health risks associated with the ambient air quality" was registered with the Industrial Foundation of Algorithms and Programs at the Republican Center for Medical Technologies, Computer Systems, Administration and Management of Health (registry number 000238, registered on 06/12/2012).

Methodology for assessment of public health risks associated with environmental factors is especially important in disputable city-planning situations when adjustment of dimensions of a sanitary protection zone is required.

A sustainable development model was approved at the UN Summit Planet Earth in Rio de Janeiro in 1992; the model combines economic growth and environmental necessity to preserve the most valuable resources on our planet – soil, air, and water. A 'green' economy concept was approved at the UN Conference in Rio de Janeiro in 2012 (Rio +20); the concept is based on sustainable development combined with transformative changes [4].

A 'green' (or eco-economy) concept is currently promoted in the global political, scientific and social communities.

Eco-economy improves well-being of people and provides for social justice as well as decreases risks to the environment.

The sanitary regulations, codes and hygienic standards have been brought up to date with the international regulations, guidelines and responsibilities of the Republic of Belarus under the international conventions.

Sanitary norms, regulations and hygienic standards "Hygienic requirements to the quality of ambient air in urban areas and tourist locations" approved by the resolution №77 of 30/06/2009 of the Ministry of Health of the Republic of Belarus

Sanitary norms, regulations and hygienic standards "Hygienic requirements to engineering, construction, re-construction and clearing for operation" approved by the resolution №12 of 10/01/2011 of the Ministry of Health of the Republic of Belarus

"Maximum permissible concentration standards for ambient air pollutants and relatively safe impact levels of pollutants in the ambient air in urban areas and tourist locations" approved by the resolution №186 of 30/12/2010 of the Ministry of Health of the Republic of Belarus

– "Classification of air pollutants in terms of hazard level and classification procedures" approved by the resolution №174 of 21/12/2010 of the Ministry of Health of the Republic of Belarus. According to the legislation of the Republic of Belarus, there are 653 maximum permissible concentrations differentiated by time – maximum one-time, average daily, average annual, and 1424 relatively safe impact levels that include 17 pollutants of identified hazard class.

The Republican Scientific Practical Center of Hygiene State Enterprise has conducted approximately 250 studies aimed at assessing public health risks associated with the ambient air pollutants and noise pollutants caused by industrial discharges and emissions for the provision of a rationale for the sanitary protection zone design and for the environmental impact assessment when implementing planned activities. Seventy-eight enterprises operating in different economic areas in the Republic of Belarus were selected to analyze the results of the risk assessment studies. Here is a list of the most common substances detected in the discharges of the studied facilities: nitrogen dioxide, carbon monoxide, solids (undifferentiated in terms of air/aerosol composition) – 100%, sulfur dioxide – 74%, phenols – 45%, formaldehyde – 44%, aliphatic saturated hydrocarbons C11–C19 - 36%, ammonia – 36%, benzene – 23%, hydrogen sulfide - 23%, toluene, ethylbenzene, manganese and its compounds – 20%.

There is an imperative need for clear provisions and requirements that will regulate the organization of field analytical (lab) studies of the pollution content in the ambient air at the sanitary protection zone borders and in a residential area. Environmental safety and sustainable development of an area are feasible only with permanent control of the ambient condition.

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