

APPLICATION OF INFORMATION TECHNOLOGIES IN HEALTH AND ENVIRONMENTAL SYSTEMS IN ASSESSING THE HEALTH RISK IN LINE WITH EUROPEAN INITIATIVES AND PRACTICES

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ABSTRACT

Caring about the environment as an important factor in public health is a driving force for innovation in governmental and European Union (EU) policies in the pursuit of its preservation and restoration. According to the findings of the European Commission, European citizens are concerned about their health and quality of life associated with the state of environment - they consider that their health may be "very" or "fairly" damaged due to its pollution. The main priorities of the European Commission to promote effective policies for protecting human health in complex interactions with the environment are outlined in the 2003 "European Strategy for Environment and Health", followed by "European Action Plan for Environment and Health 2004-2010". Following Parma Declaration of the Fifth Ministerial Conference in 2010, WHO formulated recommendations on public health responses to extreme weather events and the health consequences of climate change. For the conduction of more effective assessments of the impact of environment on human health, in the basic documents of the WHO and the European Commission has been highlighted the need of: developing a good information basis and supporting researches in the field of "health-environment", including a coordinated approach to biomonitoring. Achieving goals is possible with an integrated approach regarding the prevention measures, which allows for policies and researches on priority themes in "health-environment" area to work in synergy. The implementation of the tasks is done by stages, where the ultimate goal of this approach is to provide comprehensive data and unified information system within the EU, which brings together information about the complex impact of environment on human health. Under the leadership of WHO in the field of "health-environment" in the European region, there have been laid the foundations of the creation of the European information system based on indicators and evidence, ENHIS (Environment and Health Information System), followed by other measures and initiatives that are related to application of information technologies in the evaluation and analysis of health risks in the field of "environment and health".

Keywords: *health-environment, information technologies, health risk, European initiatives*

Introduction: Caring for the environment as an important factor in public health is a driving force for innovation in the state and community policies in the pursuit of its preservation and restoration. According to the findings of the European Commission (EC), European citizens are concerned about their health and quality of life associated with the state of the environment - they consider that their health could be "very" or "fairly" damaged due to soil contamination. The main actions of the European Commission to promote effective policies for protecting human health in complex interactions with the environment are outlined in the European legislation. The World Health Organization (WHO) has defined recommendations to the reactions of public health associated with extreme weather events and the health consequences of climate change. For making more effective assessments of the environmental impact on human health, in the basic documents of the WHO and the European Commission has been highlighted the need of: developing a good information base and enhancing areas of research into "environment-health" - in order to ensure comprehensive data and unified EU information system that brings together data on the complex impact of the environment on human health.

Information Systems (IS) are complex products from three basic components: organization, people technology. Depending on the specifics and the scope of application various types of IS have been differentiated - medical, financial, industrial, geographical and others. As intended, they can be divided broadly into: systems designed to perform certain actions for transaction processing (Transaction Processing) and decision making (Decision Support). Modern trends in the development of IS are characterized by steadily increase in their coverage and better satisfaction of consumers' needs. By implementing automated methods, modern information technologies ensure so-called electronic interactivity for information exchange between Internet users who receive more information, knowledge and experience. Each IS includes following components:

- System for collecting primary data;
- Hardware provision - PCs, servers, communications equipment, etc.;
- Software products that implement algorithms for carrying out the necessary operations;
- Databases created by specific methods for gathering, storing and processing of the data sets;
- Trained information systems specialists.

In the implementation of **information systems and technologies (ICT) in healthcare** should be met requirements for: data collection and processing large amounts of specialized data; storage, retrieval and analysis of information; generating reports and statements; tracking trends; communications and integration with external systems. The world experience shows that by application of high-tech solutions are also achieved optimum utilization of funds and reduction of inefficient spending in healthcare. Mass implementation of ICT is a prerequisite for ensuring sustainable and effective healthcare in the directions of:

- Objectifying and automation of the entire information process - to minimize the risk of error and good management of decision-making;
- Improving and accelerating the choice of management solutions, planning and forecasting;
- Regulating the exchange of information in the vertical and horizontal direction, without time constraints;
- Relieving staff in the execution of its routines.

Building up of **IS in the healthcare** requires to be taken into account specific components: finances, organization, management strategies, education and specialization, ambitions and goals of consumers, government policy, legislation and regulations for work performance, standardization of activities and services, etc. Substantial difficulties facing the health community in the implementation of IS arisen mainly from the available resource environment, legal framework and regulations. Creation of IS in healthcare is an important component in the creation and development of the united framework of **electronic health (e-Health)**. Modern understanding of e-Health has defined it as a set of measures based on organizational, technological and legal framework covering all aspects of the functioning of the health system. According to the EC "e-Health makes use of modern information and communication technologies to meet the needs of citizens, patients and professionals in the field of health and policy makers in this area". The strategy of the European Union (EU) for electronic health (e-Health) is of great importance for achieving sustainable growth in the health sector in the European community in which information systems and technologies should be considered as a tool to ensure greater efficiency and quality in healthcare. In implementation of Directive 2011/24/EU on the rights of patients in the EU is created the European e-Health Network, which brings together national authorities responsible for the attainment of coordination, coherence and sustained implementation of e-Health in the EU. With the European plan for e-Health "Innovative healthcare in the 21st Century" (2012) are set out the main tasks to be achieved by 2020. There have been outlined the ideas for the development of European policies in the field of e-Health in perspective to 2050 - to help ensuring a healthy lifestyle. Efforts in the EU in the field of e-Health are aimed at united actions for: **building a modern and interconnected regional and national IS and adoption of legislation and administrative measures in the EU Member States** to implement the Action Plan and to achieve "European e-Health Area". In

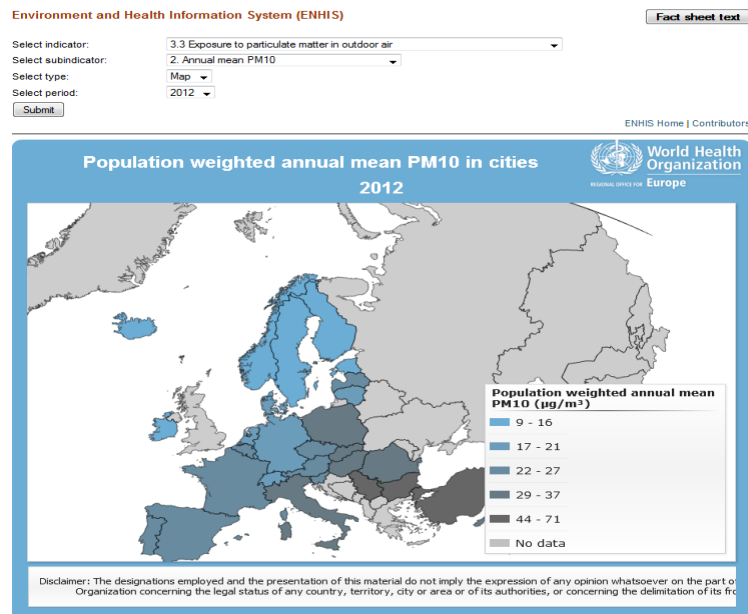
accordance with European initiatives and programs for e-Health, the national strategic framework for health policy to improve the health of the nation during the period 2014-2020, the main instrument in ensuring the efficient functioning of the healthcare system referred to **the development of e-Health and creation of a national integrated information system in healthcare**.

The main priorities of the European Commission to promote effective policies for protecting human health in complex interactions with the environment are outlined in 2003 through "European Strategy for Environment and Health", followed by "European Environment and Health Action Plan 2004-2010", with main objectives: to identify and prevent new health threats from the environment; to reduce the disease burden caused by environmental factors; to increase the EU's capacity of developing effective policies in the "environment-health" area. In 80s of the 20th century under the auspices of WHO an initiative has been launched to eliminate the most significant adverse health consequences associated with the state of the environment. The Environmental Health Action Plan for Europe (EHAPE), adopted by the Second Ministerial Conference in Helsinki, 1994, has constituted the basis for development of National Environment and Health Action Plans (NEHAPs), one of the main activities is the creation and development of **national information systems "Health-Environment"**. For conducting more effective assessments of the environmental impact on human health, in the basic documents of the WHO and the European Commission has been highlighted the need of: developing a good information base and enhancing areas of research into "environment-health" through an integrated approach to prevention measures to enabling policies and research on priority topics in the field of "environment-health", which could be able to work in synergy. The ultimate goal of this approach is to provide comprehensive data and unified information system that brings together data on the complex impact of the environment on human health.

Modern guidelines for the development, adoption and implementation of **national plans and environmental policies** are outlined in the Children' environment and health action plan for Europe (CEHAPE), adopted at the Fourth Ministerial Conference on Environment and Health (Budapest, June 2004) for effective actions to protect children's health through primary prevention, including policies, programs and plans aimed at improving the physical environment (air, water, soil, noise, etc.). With the Parma Declaration adopted at the Fifth Ministerial Conference on Environment and Health (2010) the WHO: formulated recommendations to the reactions of the public health of extreme weather events and the health consequences of climate change, outlined guidelines of the Pan-European process on environment and health, highlighted the need for a common information system for the environment and health, based on indicators. In terms of the general guidelines and priorities for the EU defined in the European Environment and Health Process (EHP), the governments of the Member States shall set corresponding national goals in the next decade to reduce the potential adverse environmental effects on the health, which will be a topic of discussion at the upcoming Sixth Ministerial Conference on Environment and Health in 2016.

Under the guidance of the WHO European Region took the initiative European Health Information Initiative (European Initiative for Health Information) - to improve the health of European region by improving the information that is the basis of politics and are established foundations of the creation of a **European Environment and Health Information System (ENHIS), based on indicators and evidence** - an interactive database composed of indicators, containing additional information about methods for calculating, ways of obtaining data, etc. (Fig.1) ENHIS is part of Environment and Health Strategy and EU Environment and Health Action Plan 2004-2010.

Fig. 1 ENHIS database



The database contains information on: exposure, health outcomes and policy actions related to the environment and health at national and regional level in the European region for priority areas of cooperation in environment and health field. By creating an "environment-health" information system has to be achieved:

- Increased efficiency in the collection, use and analysis of information for the assessment of exposure and risks to human health associated with the environment;
- Identification and prioritization of problems and management decisions;
- Supporting the development of science-based programs and projects;
- Providing competent, timely and reliable information to experts and the public.

In the European ENHIS the output report objects are displayed as tables, graphs and geographic maps based on the integral technology of Geographic Information Systems (GIS). Since the "environment-health" systems are, to a large extent, a geographic object of the study – the environmental risk factors have varied spatially and by elements of the environment (depending on weather conditions, terrain, etc.), and also the population is geographically distributed, GIS are used for:

- Pooling of information for: the environment and health/demographic and socio-demographic status of the population in a systematic form - to facilitate the exchange of information and promoting cooperation in this field;
- Combining and layering of data for health/demographic and socio-demographic status of the population and for the ecological factors – for assessment of the degree of potential impact on health and setting priorities;
- Visualization in the form of maps – convincing and synthetic tools for the management of health risks arising from environmental factors;
- Monitoring of changes in ecological and health indicators as a basis for monitoring the effectiveness and effects of applying different management programs and comparison to decisions and actions in situational modeling;
- Assistance in generating hypotheses about relationships between health and environmental factors and determination of the priorities in protecting human health and the environment.

By Decision № 1386/2013/EC of the European Parliament and the Council of Europe (11/20/2013) regarding the General Union Environment Action Programme to 2020 "Living well, within the limits of our planet", it has been assumed that it is essential to establish priority goals in

accordance with clear long-term perspective up to 2050. Among the main tasks to achieve the objectives of improving the basis of knowledge and data for EU policy in this area is to simplify, streamline and modernize: the collection, management, sharing and reuse of information on the environment and climate change, including the development and implementation of a **unified environmental information system**. According to the EC further implementation of the principle of Shared Environmental Information System (SEIS) has to be made for a single input and multiple use of information and common approaches and standards for the acquisition and collation of consistent spatial information in the systems of Infrastructure for Spatial Information in Europe (INSPIRE), Global Monitoring for Environment and Security (GMES), Copernicus (Earth observation programme), Biodiversity Information System for Europe (BISE), Water Information System for Europe (WISE), etc.

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