

ADVANCEMENT IN ADDRESSING ECOLOGICAL PROBLEMS OF WATER RESOURCES IN UKRAINE

Adelaida Sikun

Institute of Publishing and Printing,

National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

Scientific and technological progress is developing rapidly every day, which directly affects our lives. This text provides an overview of significant advances in modern environmental science with emphasis on environmental issues related to water resources.

In Ukraine, there is an extensive network of rivers, lakes, seas and reservoirs. They have an important role in agriculture, industry, ecosystem and human well-being. Water resources face many ecological challenges. Inadequate treatment of wastewater and sewerage discharges from enterprises, uncontrolled agricultural discharges lead to pollution of waters in Ukraine (Romanenko, 1999). Toxic chemicals, pesticides, radioactive metals, etc. negatively affect the quality of water and aquatic flora. Negative consequences of global warming and climate change cause changes in the type and amount of precipitation, increases in average annual temperatures and an increase of natural disasters. These changes affect water availability and quality (Osadchyi, 2017).

The latest scientific developments, such as Internet of Things (IoT) sensors and GIS (Geographic Information System) help scientists monitor water quality in real time in various bodies of water. Modern technologies are used to collect large volumes of data on various parameters of the Ukrainian aquatic environmental

pollutants. The usage of this data enables the relevant authorities to respond to cases of local pollution. The introduction of the latest developments in the field of satellite remote sensing makes it possible to collect and analyze data on the state of qualities, such as turbidity, blooms, uncontrolled spread of algae and chlorophyll concentration. Modern advances in the technologies of remote sensing include high-altitude imaging of large water bodies in a variety of spectra. The use of sensing allows the monitoring of large areas and identification of sources of pollution and the spread of environmental changes. Postolache (2019) mentions *Internet of Things (IoT) sensors*. Such sensors are placed in bodies of water to measure water parameters. (IoT) sensors are used to monitor pH, the amount of oxygen and hydrogen in water, turbidity, etc. Data from sensors is transmitted to central databases for processing and thorough analysis via mobile Internet.

Geographic Information System (GIS) technology allows inclusion of geospatial data directly related to water quality. It helps in mapping and visualising the distribution of pollutants, water quality parameters, and contamination sources. Combining GIS with other data sources provides a clear understanding of water quality issues. Online monitoring has crucial value for early warning systems. These systems detect sudden changes in water quality. In case of intensive increase in a pollution level or a harmful algal bloom, the system activates alerts, allowing authorities to respond and prevent further contamination. This allows for the quick detection of anomalies and pollution events (Postolache, 2019).

Eco-Friendly Technologies play an important part in Constructed Wetlands and Bioremediation. Constructed wetlands are engineered systems that mimic natural wetlands and use plants and microorganisms to treat wastewater, which is environmentally friendly and energy-efficient. Bioremediation technology is the usage of living microorganisms to purify and naturally normalize contaminated water.

Water treatment facilities need to widely utilise and integrate renewable energy sources as well as solar and wind energy for water facilities into their operations. It helps to reduce carbon emissions and fossil fuels. Usage of renewable energy sources

will reduce the operating costs of facilities and the rate of global warming.

Preserving the quality and of Ukraine's water resources, solving environmental problems is very important for protecting human health, development of the state and reducing the consequences of climate change. The significance of these efforts can be summarised as follows:

Environmental Protection: Protecting water bodies is critical to maintaining a healthy ecosystem. Smart technologies help identify sources of pollution and make environmental protection measures more effective. Public Health: Quality drinking water is a vital factor for human health. Free real time access to information of the drinking water protects the country's population health. Water Source Management helps in efficiently distributing limited amounts of water for various purposes. (Aini, 2001). Research and Policy Development: Continuous monitoring of data of water resources quality is the basis for research and development of agendas, rules and environmental policies of the state. Prompt response to contamination incidents: Real-time monitoring of pollution incidents allows to react rapidly, what can reduce the environmental and economic impact of contamination. Development: Proper management of water resources contributes to food security, the economic growth and improved human well-being.

References:

1. Romanenko V. D., Zhukynskii V. M., Oksiyuk O. P. at al. (1999) [Methodology of ecological assessment of the quality of surface water according to respective categories]. Kyiv, Simvol-T.

2. Osadchyi V. I. *Resources and quality of surface water in Ukraine under conditions of anthropogenic load and climate change (According to the materials of scientific report at the meeting of the Presidium of NAS of Ukraine, May 31, 2017)*. (2017). Visnyk NAN Ukrainy, 2017, No. 8. pp. 29-46. [in Ukrainian].

3. Postolache, O. A., Sazonov, E., & Mukhopadhyay, S. C. (Eds.) (2019). *Sensors in the age of the Internet of things: technologies and applications*. (IET Control, Robotics and Sensors Series; Vol. 122). The Institution of Engineering and Technology (IET). <https://doi.org/10.1049/PBCE122E>

4. Aini, M. S., A. Fakhru'l-Razi, A., & Suan, K. S. (2001). Water Crisis Management: Satisfaction Level, Effect and Coping of the Consumers, Springer; European Water Resources Association (EWRA), vol. 15(1), pages 31-39. <https://doi.org/10.17226/11031>