

# IMPACT OF ARTIFICIAL INTELLIGENCE ON ENVIRONMENTAL SECURITY SEGMENTS

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**Abstract:** *The aim of this paper is to encourage a more comprehensive study of the impact of artificial intelligence on its use in the field of environmental security.*

*Technical and technological development largely determines the environmental security situation and through which efforts will be made in the future to reduce the impact on environmental factors or threats to their development. The use of artificial intelligence is one of the methods of environmental monitoring, but in the genesis it is necessary to ideologically direct such tools in order to help humanity. One of the primary foundations is the consideration of segments of environmental security where large amounts of information would be collected, processed, analyzed and distributed in real time using artificial intelligence. The causal relationships of threats to environmental security segments to a significant extent determine the need for the introduction of artificial intelligence as an auxiliary mechanism that contributes to the monitoring of various species, plants and animals, and the human species in their habitats, investigating their development, reproduction and disappearance. Some software packages have a multidimensional and multi-criteria display of analyses, diagrams, animations and results, but artificial intelligence enables data sublimation and a very quantitative and qualitative approach and their use. This enables more purposeful writing of strategic documents and faster and higher-quality implementation of projects and programs in the field of environmental protection*

**Keywords:** *Artificial intelligence, environmental safety.*

## 1. INTRODUCTION

In many sciences and scientific disciplines, practical applications in various branches of industry, agriculture, medicine, etc., artificial intelligence (AI) is already involved in many processes that contribute to the improvement of conditions and work. The futuristic vision and prognostic character of the achievements of AI also determine development activities. Ecological processes and phenomena can unambiguously be directly and indirectly monitored, processed, analyzed and presented for the purpose of improving the general state of the natural environment. The basic scope of use of AI, which should be adopted for the use of artificial intelligence in the use of ecological safety, should be in the range of understanding the problems of environmental threats, data processing to legislative solutions. The increase in risks and threats to the living environment and the desire for greater environmental protection are largely contributing to the introduction of AI into many segments of environmental security.

The application software used so far has undoubtedly contributed to improving the state of the environment, but AI adds a new spatial and temporal dimension.

## **2. CONSIDERING ENVIRONMENTAL SAFETY IN THE MODERN LIVING ENVIRONMENT**

It is evident that the living and working environment on Earth is changing and that the indirect and direct impacts of humans on the environment are becoming increasingly destructive. Industrialization and globalization at the end of the 19th and beginning of the 20th centuries improved living conditions, the flow of goods and capital, and service activities, but also brought the roots of confrontations, social disturbances, and harmful effects on the environment. Scientific and research analyses and reports from related sciences and scientific disciplines warn us that life on the Planet is becoming more complicated due to inadequate and unplanned use of resources on the Earth (Simic, 2025:1).

Unfortunately, it is estimated that the phenomenon of climate change, the transformation of land from one category to another, demographic migrations caused by the threat to the constituents of the natural environment, the multiplication of waste materials, the discovery of "covert" applications of genetically modified organisms, the destruction of biological diversity will affect phenomena and processes in the natural and social environment.

The World Meteorological Organization estimates:

- 80% chance that at least one of the next five years will exceed 2024 as the warmest in history;
- 86% chance that at least one of the next five years will be more than 1.5°C above the average for the period 1850-1900;
- 70% chance that the five-year average warming for the period 2025-2029 will be more than 1.5°C;
- Long-term warming (averaged over decades) remains below 1.5°C;
- Arctic warming is projected to continue to exceed the global average;
- Precipitation patterns have large regional variations (<https://wmo.int/news/media-centre/global-climate-predictions-show-temperatures-expected-remain-or-near-record-levels-coming-5-years>).

These prognostic categories unfortunately represent only the basis that will trigger a series of cause-and-effect activities that will make life on Earth very difficult with the necessary needs of adaptation. Lack of resources, constant social confrontations, irresponsible attitude towards nature only complicate the already burdened status of environmental constituents. However, civilization, through technical and technological inventions, is trying to reduce its impact on the natural environment with various innovations:

- "Vacuum cleaners" for carbon dioxide from water and air are being introduced;
- Plastic is used for various purposes according to biological and chemical processes that enable its reversible use;
- Shipping containers are used for vegetable planting in urban areas;
- Various marine plants are used to make packaging;
- Development of software applications for multiple modular uses that can also be used as multipurpose;

- Development of communication systems for monitoring and processing data in the field of environmental safety;
- The Japanese government is subsidizing the development of 20 types of robots that assist in agricultural work;
- Vertical farming has become a trend, especially in urban areas;
- Automated farms have become imperative for livestock farming due to labor shortages, environmental protection requirements, etc.;
- Reports from Russian institutes indicate that robots could already take over 58% of agricultural work.

It is evident that environmental security as a scientific discipline needs to adapt its oeuvre and its characteristics in the modern era should include:

- Development of an environmental security culture;
- Interdisciplinarity;
- Multidimensionality;
- Being part of the general security system and the larger social system;
- The need for continuous qualitative improvement in the structure and mode of operation of environmental security measures;
- Basis on technical and technological achievements.

It is difficult for the human mind to comprehend the enormous amount of information that just one animal and plant habitat can contain. Microregional, regional or planetary opus not only has an enormous amount of information but is also characterized by many variables, variations, plants and animals of the same species, but which develop in different climatic conditions. The protection of animal habitats in different continental conditions is not the same, and the need for the engagement of technology and personnel increases the more severe the conditions are.

Accordingly, there is an evident need to base environmental information that would be available in certain domains for the needs of the research and scientific sector and practical application in order to protect the constituents of the natural environment in a systematic and positive way.

### **3. ARTIFICIAL INTELLIGENCE AS AN IMPERATIVE FOR MONITORING ENVIRONMENTAL SAFETY SEGMENTS**

The useful implementation of different functions and perspectives of environmental monitoring also implies a compatible information and communication system as an essential factor of monitoring based on mathematical models and analyses. Modern observation has reached unimaginable possibilities, but artificial intelligence has added multivariate solutions in many aspects. Based on the fact that environmental monitoring represents a collection of information on biological, chemical and physical characteristics of the environment, purposeful data processing and analysis implies achieving certain goals that can be achieved through artificial intelligence:

- Collection of certain data (sensors, drones, etc.);
- Necessary primary data processing (if necessary);
- Transfer of data from the natural environment to the artificial intelligence platform and

- Processing of the obtained information in a form that is understandable and organized for observing processes and phenomena in the natural environment.

The huge amount of information to be processed would be difficult to understand and difficult to process in a short period of time by a human being. Consequently, artificial intelligence can, based on the obtained parameters from the natural environment, present multidimensional diagrams, presentations, applications, variables, as well as multi-criteria analysis of the obtained results.

For specific segments of environmental security such as environmental crime, artificial intelligence enables continuous monitoring and, by following changes in the natural environment, can connect cause-and-effect relationships that may indicate different forms of environmental crime. This can provide guidelines for environmental forensics to detect possible disruption of the stability of an ecological area based on the basic state of the process and the occurrence of a microregion.

By constructing such models supported by artificial intelligence, not only in the case of discovering ecological delicate issues, it is possible to observe and define possible regularities in the development of certain processes in the environment and, based on that, determine tendencies (Boskovic, 2010:20).

A simplified representation of the model of using artificial intelligence in environmental security can be shown in Fig. 1: Simplified representation of the application of artificial intelligence in the field of environmental security. It is evident that the basic basis is the constituents of the environment, and the collection and processing of their state and presentation to a logically reasoning human being is taken over by artificial intelligence.

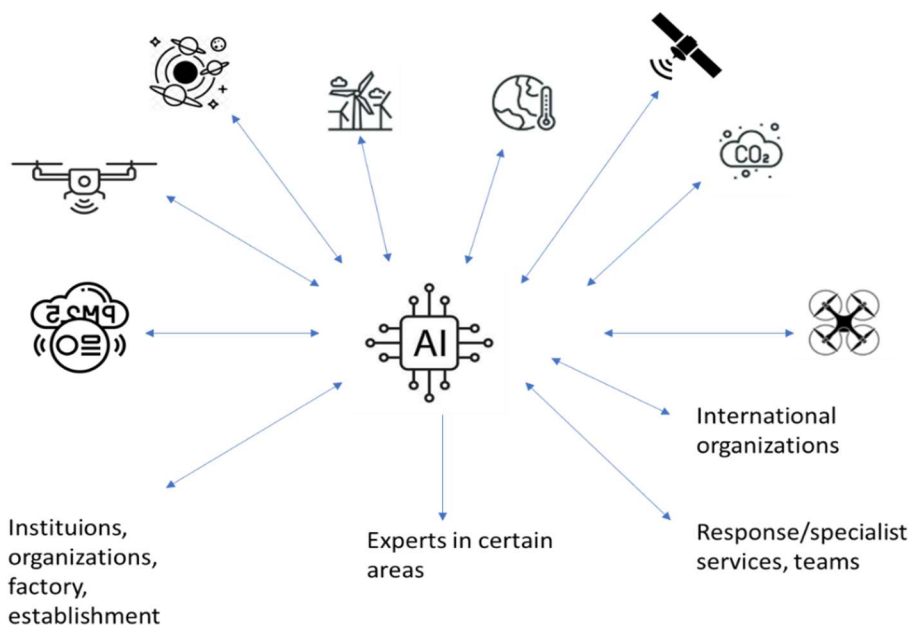


Figure 1: Simplified representation of the application of artificial intelligence in the field of environmental safety

Based on the use of artificial intelligence to predict climate change, Kyungmee and Boulanin (2023) list several key points:

- Understanding and forecasting the impact of climate hazards;
- Managing vulnerabilities and exposure to climate change;
- Entry points for artificial intelligence in response to climate change security risks;
- Tools for mapping climate hazards and socio-economic stressors;
- Managing climate change-related disaster risks;
- Examples of policy interventions addressing climate change-related security risks;
- Challenges associated with artificial intelligence.

Typical examples of the use of artificial intelligence are in agriculture and forestry. Spiric, Zrnic and Zagar (Spiric, Zrnic, Zagar, 2024:37) believe that the Internet of Things, which is a set of networked devices with the ability to communicate with each other, and their use enables advanced collection of agrometeorological data vital for analyzing the state of crops in the field. Data such as temperature, humidity, atmospheric pressure, etc. give us a precise description of past and present weather conditions that have a positive or negative impact on plants depending on the time of consideration. Consistent data collection enables the application of analysis using machine learning or artificial intelligence.

Maksimovic and Đorojevic (Maksimovic, Đorojevic, 2024:240) prefer the use of drones to collect certain data on the state of forest potential and data processing through artificial intelligence. They cite enormous benefits in terms of "...valuable information on the state of biological reclamation through afforestation...", but also data on forest fires, forest mapping, forest inventories, determining the height of the forest canopy, determining the time and need for tree pruning, etc.

A typical example of the use of artificial intelligence is the program X NATURA (<https://www.xnatura.com/environmental-platform>).

The program provides real-world data on nature, climate change and biodiversity by: integrating AI as well as data from IoT (Internet of Things) and CLOUD infrastructure to provide impact assessments on environmental constituents and environmental analysis. The program is divided into program units: Advanced Satellite Monitoring, Real Time Data from Nature, Biodiversity and Nature Strategist, AI Algorithms and Predictive Models and VIA-Environmental Impact Assessments.

For users of this platform, direct and indirect decision-making is enabled based on monitoring and reporting, maps and real-time situational awareness, and the establishment of strategies and courses of action.

Accordingly, the platform monitors, for example, patterns of animal migration (e.g., to monitor a specific mammal that is born, grows, reproduces, and dies, and points out risks and threats to it and suggests certain levels of protection) and plants, and provides assessments and trends for the future.

The sectors that the X NATURA platform basically considers are: industry, urbanism, agriculture, the energy sector, infrastructure, finance, pharmacology. Here, AI serves as a processing organ in the system, a sublimator, and an integrator.

It is not too much to expect that in the coming period we will obtain: exact parameters of resource consumption, pollution depending on the type of environment, formation of an

ecological index, more information and better assessment (because the current AI model learns and provides information for the next model), potential recommendations for improving environmental protection, legislative steps, etc.

Platforms of this type have a humanitarian basis, but are essentially commercial. Regardless of the genetic basis of the emergence of artificial intelligence platforms that serve this purpose, the positive effects are visible and purposeful. However, one should also bear in mind the negative consequences that exist due to the nature of the software and hardware components of information and communication equipment.

Most large AI systems are housed in data centers, including those operated by cloud service providers. These data centers can have a major impact on the planet. The electronics they are embedded in rely on a staggering amount of energy, with 800 kg of raw materials required to make a 2 kg computer. Also, the microchips that power AI require elements that are rare on Earth and are often mined in environmentally harmful ways.

Another problem is that data centers produce electronic waste, which often contains hazardous substances such as mercury and lead.

Third, data centers use water during construction and, once operational, to cool electrical components. Globally, AI-related infrastructure could soon consume six times more water than Denmark, a country of 6 million people. This is a problem when a quarter of humanity already lacks access to clean water and sanitation.

Finally, data centers that power AI technology require a lot of energy, which in most places still comes from burning fossil fuels, which produces greenhouse gases that warm the planet. A request made through ChatGPT, an AI-powered virtual assistant, uses 10 times more electricity than a Google search, the International Energy Agency reported. While global data is scarce, the agency estimates that in the tech hub of Ireland, the rise of AI could lead to data centers accounting for almost 35% of the world's energy consumption by 2026 (<https://www.unep.org/news-and-stories/story/ai-has-environmental-problem-heres-what-world-can-do-about>).

Also, Mary Francisco (Francisco, 2023:61) believes that the use of artificial intelligence for the purpose of environmental security segments can cause problems in international climate security due to distrust, failure to provide information about the state of the environment due to the method of collection and processing by artificial intelligence, and the possibility that software applications used for the purpose of environmental security can also be used to collect other data about the parties to the conflict.

#### **4. CONCLUSION**

In line with the increasing application of artificial intelligence in all spheres of life, it is evident that the new era will also bring its increasing application in the segments of environmental safety. The ability of artificial intelligence to collect, process and present the obtained information in a short period of time and in different natural environments in different ways, and store it in databases that serve it for further processing and improvement of the system will significantly contribute to its increasing participation in making decisions on environmental protection. This will be especially important in direct monitoring of the natural environment, where environmental protection measures will be used multiple times on different grounds.

Data collection, processing, analysis and delivery according to the requirements of different users require not only the possession of a huge amount of information on the state of the environment, but also the need to develop communication systems, improve software and

hardware, and improve environmental legislation. This would ultimately contribute to the systemic solution of environmental safety problems.

The upgrade of artificial intelligence platforms in this area will certainly imply even greater integration of information and communication systems, but also the increasing use of multi-layer advanced neural networks and evolutionary algorithms.

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